This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at http://books.google.com/

Dette er en digital utgave av en bok som i generasjoner har vært oppbevart i bibliotekshyller før den omhyggelig ble skannet av Google som del av et prosjekt for å gjøre verdens bøker tilgjengelige på nettet.

Den har levd så lenge at opphavretten er utløpt, og boken kan legges ut på offentlig domene. En offentlig domene-bok er en bok som aldri har vært underlagt opphavsrett eller hvis juridiske opphavrettigheter har utløpt. Det kan variere fra land til land om en bok finnes på det offentlige domenet. Offentlig domene-bøker er vår port til fortiden, med et vell av historie, kultur og kunnskap som ofte er vanskelig å finne fram til.

Merker, notater og andre anmerkninger i margen som finnes i det originale eksemplaret, vises også i denne filen - en påminnelse om bokens lange ferd fra utgiver til bibiliotek, og til den ender hos deg.

Retningslinjer for bruk

Google er stolt over å kunne digitalisere offentlig domene-materiale sammen med biblioteker, og gjøre det bredt tilgjengelig. Offentlig domene-bøker tilhører offentligheten, og vi er simpelthen deres "oppsynsmenn". Dette arbeidet er imidlertid kostbart, så for å kunne opprettholde denne tjenesten, har vi tatt noen forholdsregler for å hindre misbruk av kommersielle aktører, inkludert innføring av tekniske restriksjoner på automatiske søk.

Vi ber deg også om følgende:

- Bruk bare filene til ikke-kommersielle formål
  Google Book Search er designet for bruk av enkeltpersoner, og vi ber deg om å bruke disse filene til personlige, ikke-kommersielle formål.
- Ikke bruk automatiske søk
  Ikke send automatiske søk av noe slag til Googles system. Ta kontakt med oss hvis du driver forskning innen maskinoversettelse, optisk tegngjenkjenning eller andre områder der tilgang til store mengder tekst kan være nyttig. Vi er positive til bruk av offentlig domene-materiale til slike formål, og kan være til hjelp.
- Behold henvisning
  Google-"vannmerket" som du finner i hver fil, er viktig for å informere brukere om dette prosjektet og hjelpe dem med å finne også annet materiale via Google Book Search. Vennligst ikke fjern.
- Hold deg innenfor loven
  Uansett hvordan du bruker materialet, husk at du er ansvarlig for at du opptrer innenfor loven. Du kan ikke trekke den slutningen at vår vurdering av en bok som tilhørende det offentlige domene for brukere i USA, impliserer at boken også er offentlig tilgjengelig for brukere i andre land. Det varierer fra land til land om boken fremdeles er underlagt opphavrett, og vi kan ikke gi veiledning knyttet til om en bestemt anvendelse av en bestemt bok, er tillatt. Trekk derfor ikke den slutningen at en bok som dukker opp på Google Book Search kan brukes på hvilken som helst måte, hvor som helst i verden. Erstatningsansvaret ved brudd på opphavsrettigheter kan bli ganske stort.

Om Google Book Search

Googles mål er å organisere informasjonen i verden og gjøre den universelt tilgjengelig og utnyttbar. Google Book Search hjelper leserne med å oppdage verdens bøker samtidig som vi hjelper forfattere og utgivere med å nå frem til nytt publikum. Du kan søke gjennom hele teksten i denne boken på `http://books.google.com/`

BRANNER
GEOLOGICAL LIBRARY

Gift of

Robert H. Palmer Estate

DUPL.
Vat

DEN NORSKE NORDHAVS-EXPEDITION

1876—1878.

---

2. BIND.

BODL. LIB.
CANCELLED

19711. c. 4
20122. c. 1

1011

BRANNER
GEOLOGICAL LIBRARY

STANFORD UNIVERSITY LIBRARIES

Gift of

Robert H. Palmer Estate

DUPLICATE.

DEN NORSKE NORDHAVS-EXPEDITION

1876—1878.

---

2. BIND.

BODL. LIB.
CANCELLED

19711. c. 4
20122. c. 1

DEN NORSKE NORDHAVS-EXPEDITION

1876—1878.

General reports

ANDET BIND. (in 2 pts)

Meteorologi . . . . af H. Mohn.

Nordhavets Dybder, Temperatur og Strømninger . . af H. Mohn.

THE NORWEGIAN NORTH-ATLANTIC EXPEDITION

1876—1878.

SECOND VOLUME.

19711. c. 4

Meteorology . . . . by H. Mohn.

v. 2:1

20122. c. 1

The North-Ocean, Its Depths, Temperature and Circulation . by H. Mohn.

v. 2:2

instructed to name the following: — The library of the University of Christiania; the library of the Meteorological Institute, Christiania; the library of the Bergen Museum; and the library of the Videnskabernes Selskab, Throndhjem.

On the next page is a form of receipt, which you will please fill out, and return, *postage paid*. Compliance with this request constitutes the condition on which to insure the forwarding of the parts subsequently published.

Dr. H. MOHN.
Chairman of the Committee.

Dr. G. O. SARS.

Dr. D. C. DANIELSSEN.

DEN NORSKE NORDHAVS-EXPEDITION 1876—1878.

X.

METEOROLOGI.

AF

H. MOHN.

MED 13 TRÆSNIT, 3 PLANCHER OG 1 KART.

CHRISTIANIA.
GRØNDAHL & SØNS BOGTRYKKERI.
1883.

I COMMISSION HOS H. ASCHEHOUG & Co.

DEN NORSKE NORDHAVS-EXPEDITION

1876—1878.

General reports

METEOROLOGI.

AF

BODL. LIB. CANCELLED

H. MOHN.

MED 13 TRÆSNIT, 3 PLANCHER OG 1 KART.

114

CHRISTIANIA.
GRØNDAHL & SØNS BOGTRYKKERI.
1883.

CIRCULAR

from the *Editorial Committee* of

The Norwegian North-Atlantic Expedition.

The "General Report of the Norwegian North-Atlantic Expedition" is published in parts, each Memoir being distributed immediately on its leaving the press.

The General Report will comprise the following Memoirs: — (* published).

Capt. Wille, R. N. (Historical Account* — The Apparatus and how used* — Magnetical Observations*).

Professor H. Mohn (Meteorology* — Deep-sea Temperatures — Ocean Circulation — Astronomical Observations* — Geography and Natural History*).

Mr. H. Tornøe (Amount of Air in Sea-Water* — Amount of Carbonic Acid in Sea-Water* — Amount of Salt in Sea-Water*).

Mr. L. Schmelck (On the solid Matter in Sea-Water* — On Oceanic Deposits*).

Professor G. O. Sars (*Crustacea — Pycnogonida — Tunicata — Bryozoa — Hydrozoa — Spongozoa — Rhizopoda — Protophyta*).

Drs. Danielssen & Koren (*Holothurioidea* — Echinida — Asterida — Crinoida — Gephyrea* — Anthozoa*).

Mr. H. Friele (*Buccinidæ* — Brachiopoda*).

Dr. G. A. Hansen (*Annelida**).

Mr. R. Collett (Fishes*).

The publication of the Report, for which a grant of money has been obtained from the Norwegian Storthing, is conducted in conformity with the directions of His Norwegian Majesty's Government, on whose behalf the Editorial Committee have the honour of presenting Bodleyan Library with the accompanying Part, the title of which will be found overleaf. The Committee make free to request, that on the publication of scientific works by your Institute, you will kindly remember the scientific institutions and the *savants* of this country with which and with whom you may have been brought into connexion. Of the more important public libraries in Norway, we have been

I den for den Norske Nordhavs-Expedition vedtagne Plan var indtaget meteorologiske Iagttagelser paa Havet, omfattende Vindens Retning, Styrke og Hastighed, Luftens Tryk, Temperatur og Fugtighed, Skyernes Art og Mængde, Nedbørens Art og Mængde, Søgangens Retning og Styrke, Havoverfladens Temperatur, og andre lejlighedsvis forekommende Fænomener. Iagttagelserne, udførte hver Time gjennem hele Døgnet, antoges at kunne tjene dels til Bestemmelse af de meteorologiske Elementers daglige Periode i Sommermaanederne paa et hidtil i denne Henseende ikke udforsket Strøg af Verdenshavet, dels til Oplysning om Vejrforholdene sammesteds, navnlig ved Indførelse i synoptiske Karter. Forsøgsvis skulde anstilles Iagttagelser over Havvandets Fordunstning.

De meteorologiske Iagttagelser paa Expeditionen bleve organiserede af mig, og som Deltager i samme paa alle dens Togter havde jeg dagligt Tilsyn med deres Udførelse.

I denne Afhandling skal jeg først beskrive de anvendte Instrumenter og deres Brug samt Iagttagelsernes Reduction, for hvert af de meteorologiske Elementer særskilt. Dernæst skal jeg give, i Tabelform, de reducerede Iagttagelser, og til Slutning de Resultater, der ere udledede af disse. Som Tillæg skal jeg meddele mine Iagttagelser over Havvandets Fordunstning.

The Scheme of Work for the Norwegian North-Atlantic Expedition included Meteorological Observations at Sea, comprising the direction, force, and velocity of the wind, the pressure, temperature, and humidity of the atmosphere, the form and amount of cloud, the nature and amount of the precipitation, the direction and state of the sea, the temperature of the sea-surface, and phenomena of occasional occurrence. Such observations, taken every hour of the twenty-four, would serve, it was believed, partly to determine the diurnal period of the meteorological elements during the summer months throughout a tract of ocean till then unexplored, and partly to elucidate questions bearing on the weather in that region of the North-Atlantic, the results being inserted in synoptical charts. Moreover, experiments were to be made on the evaporation of sea-water.

The meteorological work was planned and organized by myself; and having accompanied the Expedition as a member on each of its three cruises, I had daily opportunity of superintending the observations.

In this Memoir, I shall first describe the instruments employed and the mode of using them, as also the reduction of the observations, — separately for each of the meteorological elements; I shall then tabulate the reduced values, and finally set forth the results deduced therefrom. An Appendix will contain my observations on the evaporation of sea-water.

I. Vind.

Ombord i et Skib, der er i Fart, og navnlig paa et Dampskib, føles Vinden i en Retning og af en Hastighed, der i Regelen begge ere forskjellige fra den virkelige Retning og Hastighed af Vinden. For at kunne finde den sande Vindretning og Vindhastighed maa man derfor enten directe observere Vindens Virkning paa Søens Overflade, eller man maa ved Observation bestemme Vindens Retning og Hastighed, saaledes som den fornemmes ombord, og ved Beregning, idet man tillige har iagttaget Skibets Retning og Hastighed, af disse Data søge at komme til Resultatet.

I. Wind.

The direction and velocity of the wind as felt on board a ship in motion, more particularly a steamer, are as a rule both found to differ from the true direction and velocity. In order, therefore, to find the true direction and velocity of the wind, we must either observe the effect of the latter on the surface of the sea, or determine its direction and velocity as felt on board, and then, the direction and rate of the vessel having been observed, compute the true result.

Fig. 1.

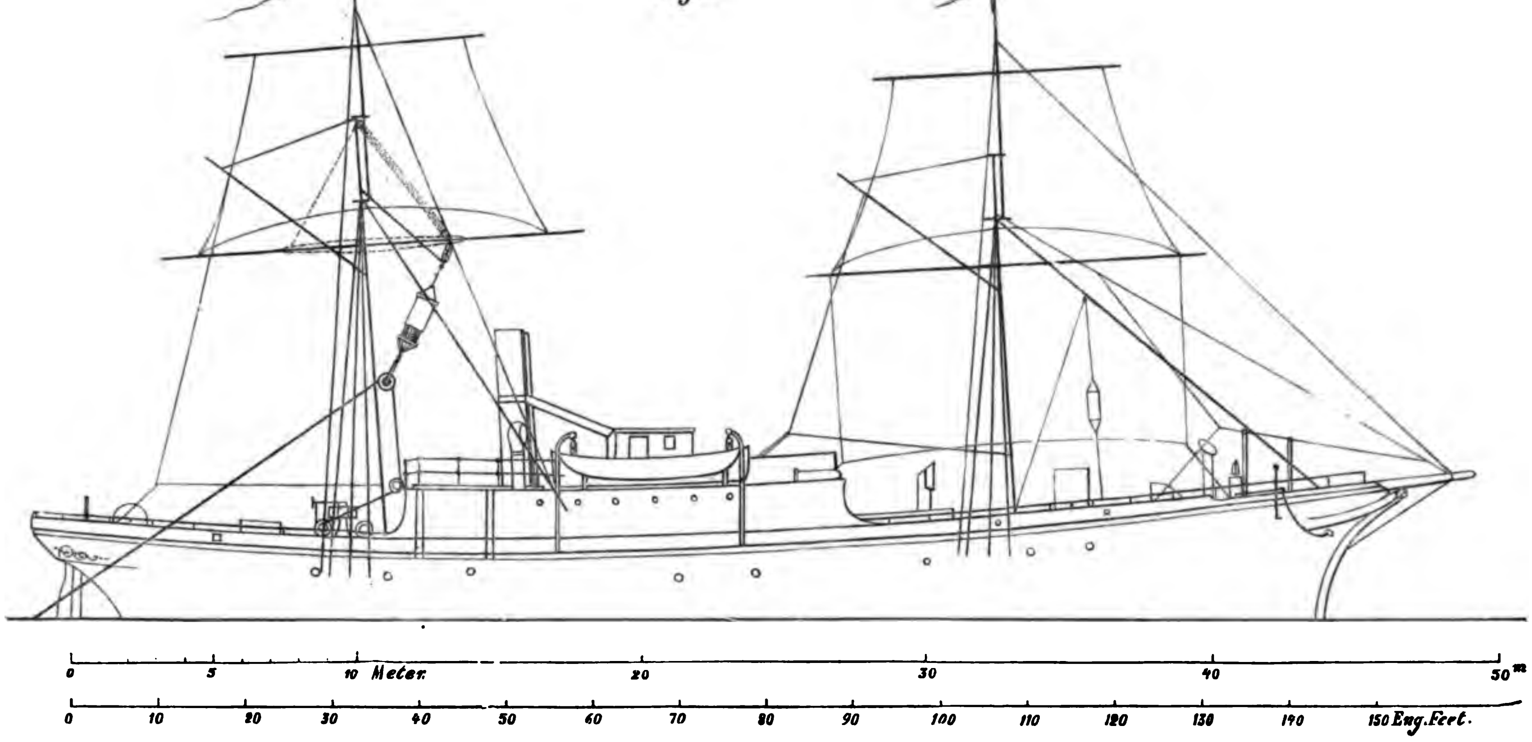


Fig. 2.

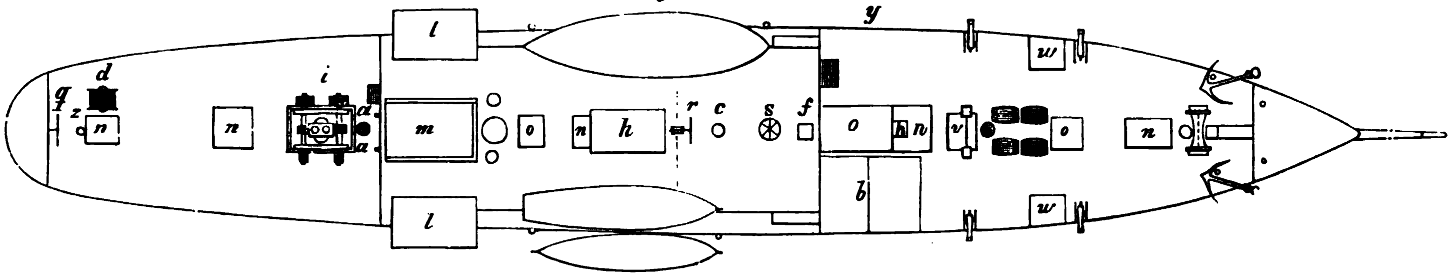


Fig. 3.

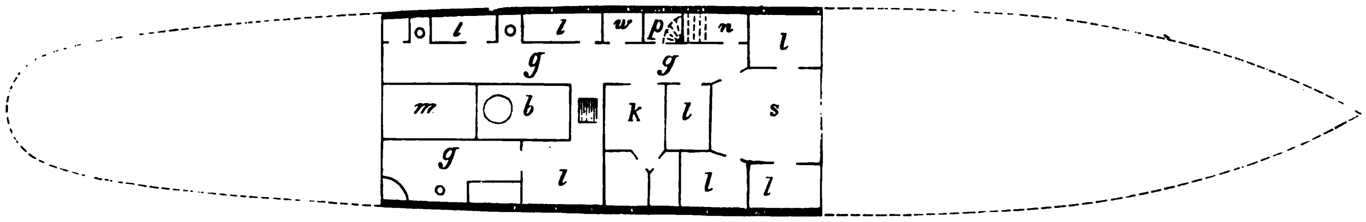
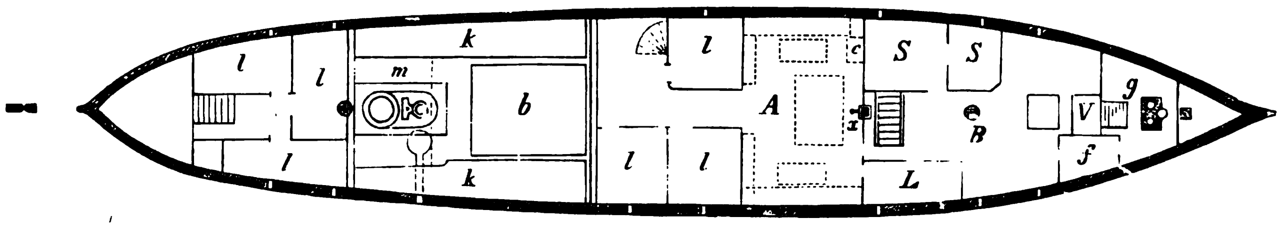


Fig. 4



Da alene den sidste Methode tillader Anvendelsen af nøjagtigere Maaleapparater og derved i Regelen vil kunne give ulige større Nøjagtighed end den første, blev den vedtaget til Brug paa vor Expedition.

Vindens Retning ombord observeredes efter Compasset. Dette, et Admiralitets Standard-Compas, stod paa Hyttedækket, foran Rattet, ved *c*, Fig. 2. Staaende i Læ af Compasset, kunde man, med alle Vindretninger, der ikke gik over det agtenfor staaende Bestikhus *h* — hvilket ikke existerede i 1876 — efter Følelsen af Vindens Virkning paa Ansigtet bestemme dens Retning og projicere samme paa Compasrosen med en Nøjagtighed, der svarer til omtrent en halv Streg eller 5 Grader. Ellers havde man til Vejledning og til Kontrol saavel Røgen af Skorstenen som Retningen af en paa Fortoppen hejst Vager, hvis Vinkel med Diametralplanet let lod sig bestemme og hvis Retning derigjennem kunde overføres til Compasset. Vageren, der brugtes i 1877 og 1878, var 1.4 Meter lang, se Fig. 1, og kunde saaledes observeres med Lethed fra Compasset af. I 1876 anvendtes ofte en liden Vimpel paa en Stage paa Forkant af Hyttedækket.

Vindens Hastighed ombord observeredes med et Robinsons Anemometer. Iagttageren valgte en Plads paa Hyttedækket, hvor Instrumentet var mest udsat for Vindens Virkning. I Regelen var dette paa Forkant af Hytten, men med Vinden agtenfor tvers stod han paa den luv Loddebro (*l* Fig. 2). Vindmaaleren holdtes i Haanden, saa højt som muligt, og med Omdrejningsaxen vertical. Registreringen af dens Bevægelse varede i Regelen 30 Secunder.

I 1876 brugtes en engelsk Vindmaaler, der i sin Tid var sendt fra Admiral Fitz Roy til den norske Fyrdirectør. Den havde 5 Skiver, hver inddelte paa Randen i 10 Dele. Skiverne drejede sig om horizontale Tapper, som vare stillede verticalt over hverandre. Armenes Længde, fra Omdrejningsaxens Centrum til Centrum af Halvkuglerne, var 0.1538 Meter og Halvkuglernes Diameter var 0.1046 Meter. Ved Observation lod man i Regelen Instrumentet dreje sig frit rundt af Vinden, noterede, idet Uret viste 0 Secunder, Aflæsningen af Viseren paa det nederste Hjul, og derpaa Aflæsningen af samme, naar Uret viste 30 Secunder. Ved svage Vinde lod man ofte Registreringen vare 1, $1^1/_2$ eller 2 Minuter. Undertiden, naar Vinden var sterk, stillede Iagttageren, ved at dreje Korset rundt, Viseren paa nederste Hjul paa 0. I det Øjeblik, Registreringen begyndte, løftedes Instrumentet hurtigt op i Vejret, og naar de 30 Secunder vare forløbne, førtes det hurtigt ned igjen og standsedes, hvorpaa Viserens Stand aflæstes. Undertiden brugtes et Timeglas i Stedet for Ur.

De Observationer, som gjordes med dette Instrument, ere beregnede efter den tidligere antagne Regel, at Vindens Hastighed er 3 Gange saa stor som Halvkuglecentrernes Hastighed. Efterat det er bleven paavist, navnlig ved de

As the latter method only will admit of using apparatus for actual measurement, and as a rule, therefore, gives far superior results to the former, it was exclusively adopted on the Norwegian Expedition.

The Wind's Direction on board was observed by the compass — an Admiralty standard compass, mounted (Fig. 2 *c*) on the spar deck, immediately in front of the wheel. Standing to leeward of the compass, from whichever quarter the wind might blow, provided only it did not come straight aft over the deck-house *h* (put up in 1877), the observer could, by turning his face to the wind, tell the direction in which it was blowing, and project that direction on the compass-card with an accuracy corresponding to about half a point, or five degrees. There was, too, the smoke from the funnel to act as a guide, and a vane at the foretopmast head, the direction of which — the angle subtending between it and the fore and aft line of the ship being easily determined — could be transferred to the compass. This vane — adopted in 1877 and 1878 — was 1.4 metre in length (see Fig. 1), and could therefore be easily observed from the compass. In 1876, a small pennant attached to the top of a pole on the fore part of the deck of the roundhouse, was frequently made use of.

The Velocity of the Wind on board was measured with a Robinson's anemometer. The observer chose a position on the deck of the roundhouse in which the instrument would be most exposed to the wind. This was generally on the fore part of the deck of the roundhouse; but with the wind abaft the beam, the observer stood on the windward sounding-bridge (*l*, Fig. 2). The anemometer was held in the hand, as high as possible, with its axis in a vertical position. The registering of its motion lasted as a rule 30 seconds.

The anemometer used on the first cruise, in 1876, was an English instrument, sent many years ago by Admiral Fitz Roy to the Director of Norwegian Lighthouses. It had five dials, each divided on the limb into ten equal parts. The dials revolved on horizontal pivots, arranged vertically one above the other. The length of the arms from the centre of revolution to the centres of the cups was 0.1538 metre, and the diameter of the cups 0.1046 metre. When taking an observation, the instrument was as a rule allowed to revolve freely with the wind, the indication of the hand of the lowest dial being first read off at 0 seconds of the observer's watch, and then exactly 30 seconds after. In a gentle breeze the registering was frequently protracted for the space of $1^1/_2$ or 2 minutes. Sometimes, when it was blowing hard, the observer would, by turning round the cross, adjust the hand of the lowest dial to zero. On commencing the registering, the instrument was lifted quickly up, and, at the expiration of 30 seconds, brought quickly down and stopped, after which the indication of the hand was read off. Now and then an hourglass was substituted for a watch.

The observations taken with this anemometer have been computed on the assumption that the velocity of the wind was three times that of the cup centres. Meanwhile, this assumption is not admissible, as appears from the in-

Forsøg, som Directøren for det fysiske Central-Observatorium i St. Petersburg, Prof. H. Wild, dersteds har ladet udføre, at denne Regel ikke er gyldig, var det af Vigtighed at faa bestemt Størrelsen af de Fejl, som den antagne Forudsætning indførte i Resultaterne. Dette er lykkets, da en af de i St. Petersburg prøvede Vindmaalere er construeret nøjagtig efter samme Model som den af os anvendte.[1] Ved den af Dohrandt som "Elektrisk registrerende No. 4" betegnede Vindmaaler er nemlig opgivet Længden af Armene $r = 0.^{m}1551$ og Diameter af Halvkuglerne $= 0.^{m}1044$. Endvidere er for dette Instrument fundet Forholdet mellem Vindens og Kuglecentrernes Hastighed at være 2.5293, istedetfor 3. Vindvejen, der svarer til en Omdrejning af Verticalaxen, er altsaa $2\pi r \times 2.5293$, eller, ved vort Instrument $2\pi \times 0.1538 \times 2.5293$, det er $2.^{m}445$. Ti Omdrejninger af Axen eller 1 Delstregsinterval paa nederste Hjul bliver saaledes $24.^{m}45$. Den ældre Regel giver $29.^{m}0$.

Instrumentets Frictionscoefficient, eller den mindste Vindhastighed, som er istand til at dreje Instrumentet rundt, kunde jeg bestemme paa følgende Maade. Den 1ste Juni 1876, i Sognefjorden, ganske stille Vejr, fandtes den Distance, Fartøjet havde udløbet i 16 Minuter, efter udmerkede Pejlinger og Kartet, at være 3900 Meter. Dette giver en Hastighed af 3900 : 960 eller 4.062 Meter pr. Secund. I det samme Tidsrum registrerede Vindmaaleren, frit opstillet som ved Observation, 99.9 Dele af nederste Skive. Hertil svarer en Vindvej af $99.9 \times 24.^{m}45$ eller $2442.^{m}6$, altsaa en Hastighed af $2442.^{m}6 : 960$ eller 2.544 Meter pr. Secund. Fartøjets Hastighed gjennem Luften eller den ombord følte Vindhastighed var altsaa $4.^{m}062$ pr. Secund, medens Vindmaaleren angav kun $2.^{m}544$ pr. Sec. Dennes Frictionscoefficient er saaledes 4.062—2.544 eller 1.518 Meter pr. Secund, og Vindens Hastighed findes af Formelen

$$v = 1.518 + 2.5293\ k,$$

hvor k er Kuglecentrernes Hastighed i Meter pr. Secund.

Er det Antal Delstreger paa nederste Skive, der er registreret i 30 Secunder, n, bliver den tilsvarende Vindvej i 30 Secunder 24.45 n og Vindhastigheden $24.45\ \frac{n}{30}$ eller 0.815 n Meter pr. Secund. Formelen for Vindhastigheden bliver da

$$v = 1.518 + 0.815\ n.$$

Antages Vindhastigheden lig 3 Gange Kuglecentrernes Hastighed, faar man Vindvejen for en Omdrejning af Verticalaxen lig $3 \times 2\ \pi r$, for 10 Omdrejninger eller 1 Delstregsinterval paa nederste Skive $30 \times 2\pi r$ eller $29.^{m}0$.

[1] F. Dohrandt. Bestimmung der Anemometer-Constanten. Reperorium für Meteorologie. T. IV, No. 5.

vestigations of Professor H. Wild, Director of the Central Physical Observatory of St. Petersburg; and hence it was obviously of importance to determine the amount of the error which from that source might enter into the results. In this I happily succeeded, one of the anemometers tested in St. Petersburg having been constructed on precisely the same model as that used on our Expedition.[1] The instrument, termed by Mr. Dohrandt "electrically registering No. 4," has the length of the arms $r = 0.^{m}1551$, and the diameter of the cups $= 0.^{m}1044$. Moreover, for this instrument, the ratio of the velocity of the wind to that of the cup centres was found to be 2.5293, and not 3, as previously assumed. The distance run by the wind during one revolution of the vertical axis of the anemometer, is therefore $2\pi r \times 2.5293$, or, for our instrument, $2\pi \times 0.1538 \times 2.5293$, i. e. $2.^{m}445$. Ten revolutions of the axis = one division of the first dial $= 24.^{m}45$. The original rule gives $29.^{m}0$.

The friction coefficient of the anemometer, or the smallest velocity of the wind capable of making the instrument revolve, was determined by the following experiment. On the 1st of June, 1876, in the Sogne Fjord, the air being quite calm, the ship's distance run in sixteen minutes, as determined by excellent land bearings and the map, was 3900 metres. This gives a rate of $\frac{3900}{960}$, or 4.062 metres per second. In the same interval the anemometer registered, freely exposed, 99.9 divisions of the first dial. To this number corresponds a distance run by the wind of $99.9 \times 24.^{m}45$, or $2442.^{m}6$, — hence a mean rate of $\frac{2442.^{m}6}{960}$, or 2.544 metres per second. The true velocity of the wind as felt on board was consequently $4.^{m}062$ per second, whereas the anemometer registered only $2.^{m}544$ per second. The friction coefficient of the instrument is accordingly $4.^{m}062$ — 2.544, or 1.518 metres per second; and the velocity of the wind may be expressed by the formula

$$v = 1.518 + 2.5293\ k,$$

in which k is the velocity of the cup centres in metres per second.

If the number of divisions of the first dial registered in 30 seconds $= n$, the corresponding distance run by the wind in 30 seconds must be 24.45 n, and the velocity of the wind $24.45\ \frac{n}{30}$, or 0.815 n metres per second. Hence, the formula for the velocity of the wind will be —

$$v = 1.518 + 0.815\ n.$$

Assuming the velocity of the wind to be three times that of the cup centres, the distance run by the wind during one revolution of the vertical axis would be $3 \times 2\ \pi\ r$, and during ten revolutions, or one division of the first dial,

[1] F. Dohrandt. Bestimmung der Anemometer-Constanten. Repertorium für Meteorologie, Vol. IV, No. 5.

Naar nu Instrumentet registrerer n Dele i 30 Secunder, eller $\frac{n}{30}$ i 1 Secund, bliver den foreløbig beregnede Vindhastighed $v' = \frac{n}{30} 29 = 0.96667\ n$.

Vi faa saaledes

Sand Vindhastighed	$v = 1.518 + 0.81500\ n.$
Foreløbig Vindhastighed	$v' = 0.96667\ n.$
Correction	$v - v' = 1.518 - 0.15167\ n.$

Sættes her $n = \frac{v'}{0.96667}$ faaes

$$v = 1.518 - \frac{0.815}{0.96667} v'$$

$$v = 1.518 + 0.8431\ v'$$

$$\text{og } v - v' = 1.518 - \frac{0.15167}{0.96667} v'$$

$$v - v' = 1.518 - 0.1569\ v'$$

Herefter beregnes følgende Correctionstabel.

$30 \times 2\pi r$, or $29.^{m}0$. If the instrument registers n divisions in 30 seconds, or $\frac{n}{30}$ division in one second, the computed approximate velocity of the wind v' will $= \frac{n}{30} 29 = 0.96667\ n$.

Hence, we have —

True Velocity of Wind	$v = 1.518 + 0.81500\ n.$
Approximate Velocity of Wind	$v' = 0.96667\ n.$
Correction	$v - v' = 1.518 - 0.15167\ n.$

Now, putting $n = \frac{v'}{0.96667}$, we get

$$v = 1.518 + \frac{0.815}{0.96667} v'$$

$$v = 1.518 + 0.8431\ v'$$

$$\text{and } v - v' = 1.518 - \frac{0.15167}{0.96667} v'$$

$$v - v' = 1.518 - 0.1569\ v'$$

From this formula the following Table of Corrections has been computed.

v'	v	Corr.	v'	v	Corr.
0	fra (*from*) 0 til (*to*) + 1.5	fra (*from*) 0 til (*to*) + 1.5	13	12.5	— 0.5
1	2.4	+ 1.4	14	13.3	— 0.7
2	3.2	+ 1.2	15	14.2	— 0.8
3	4.0	+ 1.0	16	15.0	— 1.0
4	4.9	+ 0.9	17	15.8	— 1.2
5	5.7	+ 0.7	18	16.7	— 1.3
6	6.6	+ 0.6	19	17.5	— 1.5
7	7.4	+ 0.4	20	18.4	— 1.6
8	8.3	+ 0.3	21	19.2	— 1.8
9	9.1	+ 0.1	22	20.1	— 1.9
10	9.9	— 0.1	23	20.9	— 2.1
11	10.8	— 0.2	24	21.7	— 2.3
12	11.6	— 0.4	25	22.6	— 2.4

Man ser, at Fejlen ikke overstiger 1^{m} pr. Secund mellem $v' = 3^{m}$ og $v' = 16^{m}$, at den er 0, naar $v' = \frac{1.518}{0.1569} = 9.^{m}7$.

Da det anvendte Instrument og de anvendte Observationsmethoder, i Forbindelse med Vindhastighedens egen variable Størrelse selv i kortere Tidsrum end 30 Secunder, neppe tør antages at kunne maale Vindhastigheden nøjere end med omkring 1 Meters Nøjagtighed pr. Sec., da fremdeles den midlere Vindhastighed, der er maalt i 1876, er mellem 9^{m} og 10^{m}, og de maalte Hastigheder sjelden ere mindre end 3^{m} og større end 16^{m}, og da desuden hertil kommer, at den Nøjagtighed, hvormed Skibets Fart i Observationsøjeblikket kunde bestemmes i 1876, oftere neppe var større end at Fejlen kunde dreje sig om 1 til 2 Kvart-

The error is thus seen not to exceed 1 metre per second between $v' = 3^{m}$ and $v' = 16^{m}$, and to be nil when $v' = \frac{1.518}{0.1569} = 9.^{m}7$.

As both the instrument and the modes of observation adopted, in conjunction with the varying velocity of the wind even in a shorter interval than 30 seconds, will hardly admit of determining the velocity of the wind with greater exactness than 1 metre per second; moreover, as the mean velocity of the wind determined in 1876 was between 9^{m} and 10^{m}, and the measured velocities were seldom less than 3^{m} and greater than 16^{m}; and besides, as the accuracy with which the speed of the vessel at the moment of observation was determined in 1876, was often not greater than that the error ranged from 1 to 2 miles an hour, or $0.^{m}5$ to

mil i Timen, det er $0.^{m}5$ til 1^{m} i Secundet, saa har jeg ikke fundet mig opfordret til at beregne Vindhastighederne for 1876 paany efter de corrigerede Aflæsninger af Vindmaaleren, undtagen for de Observationer, som ere tagne, naar Skibet laa tilankers.

I 1877 og 1878 benyttedes en ny Vindmaaler, der var arbejdet i Christiania af Instrumentmager M. Wiig efter min Tegning. Fig. 5 viser Instrumentet i $^{1}/_{4}$ af den sande

1^{m} per second, I have not seen fit to re-compute the wind-velocities for 1876 from the corrected readings of the anemometer, save in the case of such observations as were taken when the ship lay at anchor.

In 1877 and 1878, the anemometer used was an instrument constructed in Christiania from my own design, by Mr. M. Wiig. Fig. 5 represents this anemometer $^{1}/_{4}$ of

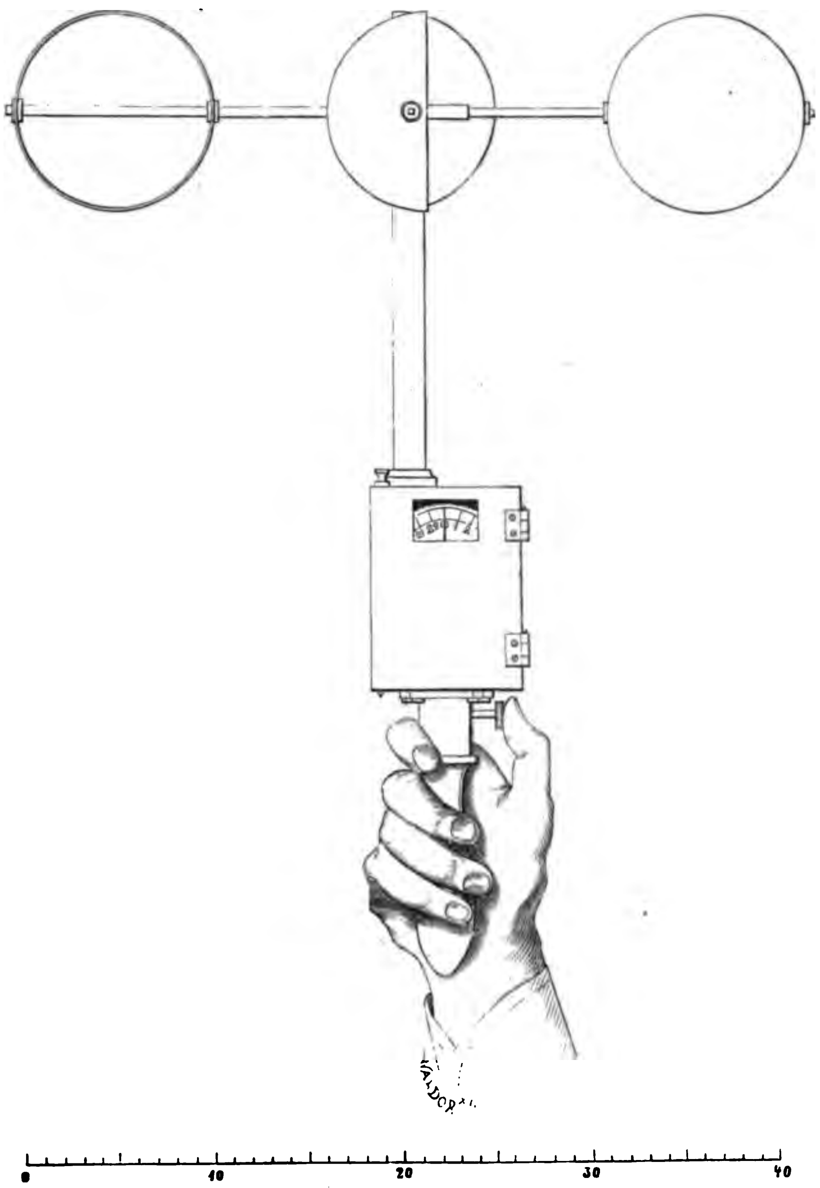


Fig. 5.

Størrelse, saaledes som det holdes under en Observation. Fig. 6 viser Registreringsmekanismen, seet forfra, og Fig. 7 den samme, seet fra Siden, begge i sand Maalestok. For at være sikker paa det rigtige Forhold mellem Vindhastigheden og Kuglecentrernes Hastighed tog jeg de samme Dimensioner som ved den ovenfor nævnte, i St. Petersburg af

the actual size, as held when taking an observation. Fig. 6 shows the registering part of the instrument, front view; and Fig. 7 the same mechanism, side view, both actual size. To make sure of the true ratio between the velocity of the wind and that of the cup centres, I took the dimensions of the anemometer tested at St. Petersburg by Mr.

Dohrandt undersøgte Vindmaaler, nemlig Armlængde $r = 0.^{m}1551$ og Kuglediameter $d = 0.^{m}1044$. Vindvejen, der svarer til en Omdrejning af Verticalaxen, er følgelig

$$2.5293 \times 2\pi r = 2.5293 \times 2\pi \times 0.^{m}1551 = 2.^{m}4648.$$

Er Vindens Hastighed i Meter pr. Secund v, Antallet af Omdrejninger af Verticalaxen i 30 Secunder n, og Instrumentets Frictionscoefficient f, saa har man

$$v = f + 2.5293 \times 2\pi r \times \frac{n}{30} = f + 2.4648 \frac{n}{30}$$

$$v = f + 0.08216.\ n.$$

Dohrandt, viz. length of arms $r = 0.^{m}1551$ and diameter of cups $d = 0.^{m}1044$. The distance run by the wind during one revolution of the vertical axis will be consequently

$$2.5293 \times 2\pi r = 2.5293 \times 2\pi \times 0.^{m}1551 = 2.^{m}4648.$$

If the wind's velocity in metres per second be v, the number of revolutions about the vertical axis in 30 seconds n, and the friction coefficient f, we have

$$v = f + 2.5293 \times 2\pi r \times \frac{n}{30} = f + 2.4648 \frac{n}{30}$$

$$v = f + 0.08216.\ n.$$

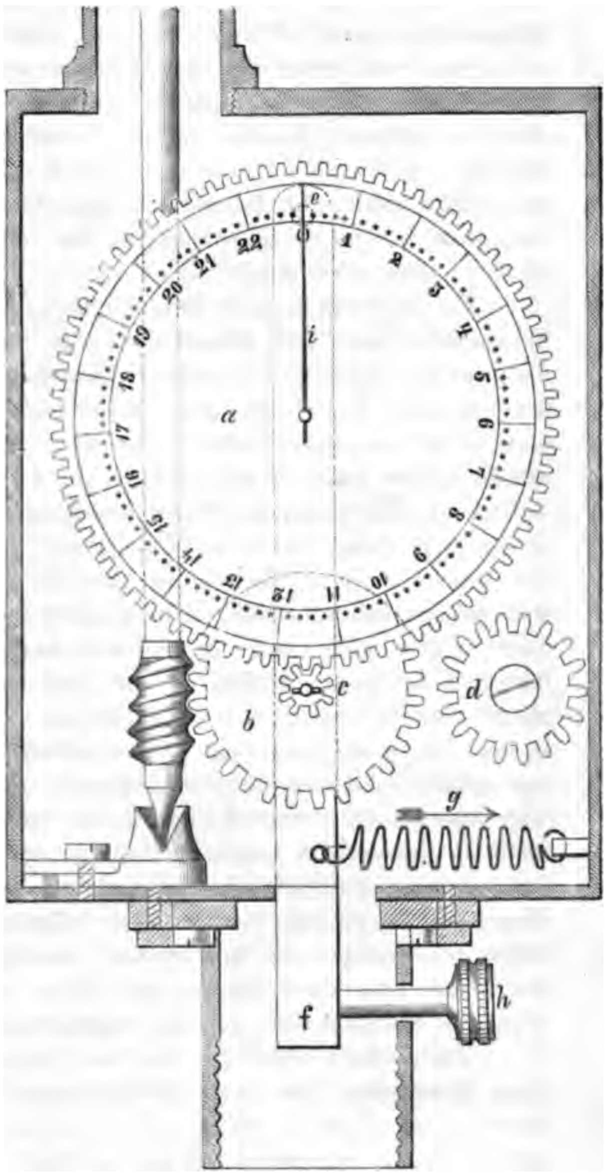


Fig. 6.

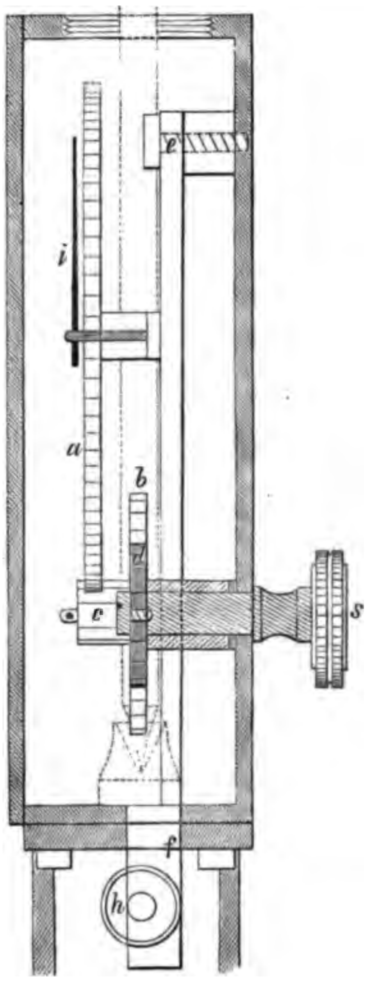


Fig. 7.

Tællerverket er nu indrettet saaledes, at Viseren angiver umiddelbart paa Skiven Værdien af $0.08216\,n$ i Meter pr. Secund, naar Registreringen har varet 30 Secunder. Dette er opnaaet paa følgende Maade. Se Fig. 6 og 7.

Den paa den nedre Del af Verticalaxen siddende

The wheelwork is so arranged that the hand reads off immediately the value of $0.08216\,n$ in metres per second, when the registration has lasted 30 seconds. This is effected in the following manner (see Figs. 6 & 7).

The endless screw on the lower part of the vertical

Skrue uden Ende drejer Hjulet *b*, der har 28 Tænder. Concentrisk med *b* og fast i dette er Drevet *c*, der har 8 Tænder. Dette drejer igjen det store Hjul eller Skiven *a*, som har 80 Tænder. Følgelig svarer 10 Omdrejninger af *b* til 1 Omdrejning af *a*. 28 Omdrejninger af Verticalaxen give en Omdrejning af *b*. 280 Omdrejninger af Verticalaxen give 10 Omdrejninger af *b* og 1 Omdrejning af *a*. Sættes altsaa $n = 280$, have vi

$$v = f + 0.08216 \times 280 = f + 23.00.$$

Skiven *a* er nu inddelt ved radiale Streger paa Randen i 23 ligestore Dele, og hver Del mellem disse ved Punkter i Femtedele, saa at Tiendedele med Lethed kunne aflæses. Dersom Viseren *i*, der staar fast paa *a*'s Omdrejningsaxe, viser paa 0 før Registreringen, vil den, efter en Registreringstid af 30 Secunder, ligefrem angive Værdien af $0.08216\ n$ eller $v-f$, eller med andre Ord Vindhastigheden minus Frictionscoefficienten, udtrykt i Meter pr. Secund. For at faa den sande Vindhastighed, behøver man følgelig kun at stille Skiven saaledes, at Viseren staar paa 0, lade Instrumentet, udsat for Vinden, registrere i 30 Secunder, aflæse hvad Viseren peger paa og dertil lægge Frictionscoefficienten.

Registreringen i et bestemt Tidsrum iverksættes paa følgende Maade. Hjulene *a*, *b* og *c* dreje sig om faste Axer, der sidde paa Armen *e f*. Denne er bevægelig, idet den ved sin øvre Ende, ved *e*, kan drejes om en i Instrumentets Bagvæg fastgjort horizontal Axe, medens dens nederste Del trækkes stadig tilhøjre (i Retning af Pilen Fig. 6) af en Metalfjeder *g*. Naar derfor Instrumentet ikke registrerer, griber Hjulet *b* ikke ind i Gjængerne paa Skruen uden Ende paa Verticalaxen, men denne drejer sig ganske frit med Halvkuglekorset. Iagttageren tager Instrumentet i Haanden, som Fig. 5 viser, med Tommelfingeren paa Knappen *h*, men uden at trykke paa denne, og løfter det i Vejret med Axen vertical. Halvkuglerne gaa nu frit rundt med Vinden. I det Øjeblik Uret viser 0 Secunder, trykker han Knappen ind. Armen *e f* med de tre Hjul flyttes ind mod Verticalaxen, Tænderne paa Hjulet *b* gribe ind i Skruen paa denne, Hjulene *b*, *c*, og *a* sættes i Bevægelse: Registreringen begynder. Den fortsættes, idet Knappen *h* holdes trykket ind, i 30 Secunder. Naar denne Tid er forløben, slippes Tommelfingeren løs fra Knappen *h*, Fjederen virker og flytter *b* fra Skruen uden Ende, og Registreringen standser.

Tandhjulet *d* har et dobbelt Øjemed. Naar Registreringen standser, gribe Tænderne paa Hjulet *b* ind i Tænderne paa *d* og dette virker som en Stopper eller Bremse til at holde Tællerverket fast, saa at Aflæsningen kan foretages senere og hvorsomhelst. Ved at dreje paa Knappen *s* paa Bagsiden af Yderkassen (Fig. 7) drejer man ogsaa Hjulet *d* og Iagttageren kan saaledes, uden at aabne Kassen, dreje Hjulene *b*, *c* og *a* og bringe Viseren til at pege paa 0.

Som man ser, er Instrumentets Construction saadan, at det med Lethed kan bruges ogsaa om Natten. Med Knappen *s* stilles, f. Ex. inde i Bestiklugaren, Viseren paa 0. Instrumentet tages ud og holdes op færdigt til Obser-

axis turns the wheel *b*, which has 28 teeth. Concentric with *b* is a cogwheel *c*, with 8 teeth, which turns the large wheel or disk *a*, furnished with 80 teeth. Consequently, 10 revolutions of *b* correspond to one revolution of *a*; 28 revolutions of the vertical axis correspond to one revolution of *b*, 280 revolutions of the vertical axis to 10 revolutions of *b* and one revolution of *a*. Hence, putting $n = 280$, we have

$$v = f + 0.08216 \times 280 = f + 23.00.$$

The dial *a* is accordingly divided by radial lines on its limb into 23 equal parts, and each part by dots into fifths, so that tenths can easily be read off. If the hand, or index, *i*, which is fixed to the axis of *a*, points to zero before registration, it will, after an interval of 30 seconds, indicate the value $0.08216\ n$, or $v-f$, that is the velocity of the wind minus the friction coefficient, expressed in metres per second. In order to get the true velocity of the wind, we have, therefore, only to place the dial so that the index points to zero; let the instrument, exposed to the wind, register for 30 seconds; and then read off the indication of the hand, adding to this number the value of the friction coefficient.

The registration in a definite interval of time is performed as follows. The wheels *a*, *b*, and *c* have their axles fixed to the arm *e f*. This arm is moveable, turning as it does at the upper end, at *e*, about a pivot in the hind part of the instrument, whereas its lower end is constantly drawn to the right (in the direction of the arrow, Fig. 6) by the metallic spring *g*. When, therefore, the instrument is not registering, the teeth of the wheel *b* do not bite in the endless screw on the vertical axis; both are quite free and revolve with the cups. The observer takes the instrument by the handle, with his thumb resting lightly on the button *h* (as shown in Fig. 5), and then raises the instrument, with its axis in a vertical position. The cups now revolve freely with the wind. At 0 seconds by the observer's watch, he presses the button inwards, the arm *e f* with the three wheels is moved towards the vertical axis, the teeth of the wheel *b* bite in the endless screw, *b*, *c*, and *a* are put in motion, and the registration begins. It is continued for 30 seconds, the button *h* being kept pressed in. After the expiration of this interval, the observer removes his thumb from the button *h*, the spring acts, removes *b* from the endless screw, and the registration stops.

The toothed wheel *d* serves two purposes. On stopping registration, the teeth of the wheel *b* bite into the teeth of the wheel *d*, which acts as a stopper or break, and keeps the wheelwork steady, so that the reading of the dial may be made at any time or place afterwards. On turning the button *s* at the back of the outer case (Fig. 7), the wheel *d* is also turned with it, and the observer can thus, without opening the case, turn the wheels *b*, *c*, and *a*, and adjust the index to zero.

As will be seen, the construction of the instrument is such as to admit of its being used with facility at night. By means of the button *s*, for example, the index is adjusted in the Deck-house to zero. The instrument is then

vation. Med et almindeligt Lommeur, der slaar 5 Slag i 2 Secunder, for det venstre Øre, og Vindmaaleren i højre Haand trykker Iagttageren paa Knappen *h* og tæller i samme Øjeblik 0. Naar han har talt 75 Slag af Uret, ere 30 Secunder forløbne, og Knappen slippes. Instrumentet bringes ind i Bestiklugaren og aflæses.

Med Hensyn til Instrumentets Construction bemerkes forøvrigt Følgende. Korset, der bærer Halvkuglerne, er fæstet til Verticalaxen med en Skrue, der ved en Fjeder, som griber i et Indsnit i denne, er hindret fra at skrue sig løs. En liden cylindrisk Kappe lige under denne Skrue drejer sig rundt med Axen og hindrer Regndraaber fra at komme ned langs Axen. Halvkuglerne ere fæstede til Armene med sterke Skruer, saa at de ikke let kunne løsne og blæse bort, og holdes tillige af dem i den rette Stilling og Afstand. Tællerverket er indesluttet i en Metalkasse, der paa Forsiden har en Dør med et lidet Vindu, gjennem hvilket Aflæsningen paa Skiven kan ske, uden at Kassen behøver at aabnes. Ved at aabne Døren kan man med Lethed komme til de enkelte Dele af Verket for at rense eller smøre dem. I Bunden af Kassen er en firkantet Aabning, netop stor nok til den fornødne Bevægelse af Armen *e f*, hvilken herved er reguleret til de bestemte Grændser til begge Sider. Den øverste Del af Haandtaget er en hul Metalcylinder, i hvilken den nederste Del af Armen *e f* med Knappen *h* bevæger sig. I denne Cylinder er Træhaandtaget indskruet og lukker saaledes forneden for Tællerverket.

Instrumentets *Frictionscoefficient* bestemtes, saa ofte der var Anledning dertil, ved i ganske stille Vejr at lade Vindmaaleren registrere den ombord følte Vindhastighed, medens Skibets Hastighed observeredes efter Vandloggen, som nedenfor skal beskrives. Ved disse Bestemmelser maa man passe nøje paa, at Luften under Registreringen er aldeles rolig. Et Kjendetegn herpaa er, at Søens Overflade ikke viser den mindste Krusning. Men dette Tegn maa være af nogen Varighed, for at man skal være sikker, thi de første Vindpust gaa henover Søens Spejl uden synlig Virkning. Kommer Vindpustene fra Siden, har man et sikkert Merke deri, at Røgen fra Skorstenen ikke viser nøjagtig ret agterover.

Iagttagelserne til Bestemmelse af Frictionscoefficienten vare følgende.

1877.

Datum.	Log. Kvartmil i Timen.	Log. Meter pr. Secund.	Vindmaaler. Meter pr. Secund.	Vindmaaler. Frictions-Coefficient.
Juni 15	7.7	4.0	2.5	+ 1.5
„ 30	7.2	3.7	2.1	1.6
„ „	7.3	3.8	2.2	1.6
Juli 15	7.0	3.6	1.7	1.9
Middel				1.65

taken out on deck and held up ready for observation. Holding to his left ear an ordinary watch (5 beats in 2 seconds), and having in his right hand the anemometer, the observer presses the button *h*, counting as he does so 0. Having counted 75 beats of the watch, 30 seconds will have elapsed, and the thumb is removed from the button. The instrument is then taken into the deck-house and the reading made.

With regard to the construction of the instrument, the following additional remarks are appended: — The cross-bars supporting the cups are fixed to the vertical axis by means of a screw, which a spring, that fits into an incision in the latter, prevents from screwing itself loose. A small cylindrical collar, placed immediately beneath this screw, revolves with the axis, and prevents drops of rain from trickling down it. The cups are fastened to the arms with strong screws, to prevent them from loosening and blowing away, as also to keep them in the right position and at the right distance. The wheelwork is adjusted in a metal case, having in front a door with a small window, through which the reading on the dial can be made without the necessity of opening the case. On opening the door, the wheelwork can be easily got at, to be cleaned or oiled when required. In the bottom of the case there is a rectangular opening, just sufficiently large to admit of the free motion of the arm *e f*, which is accordingly kept on both sides within the proper limits. The upper part of the handle consists of a hollow metal cylinder, in which moves the lower part of the arm *e f* with the button *h*. Into this cylinder is screwed the wooden handle, closing in accordingly the wheelwork from below.

The *friction-coefficient* of the anemometer was determined as frequently as opportunity offered, by registering in perfectly calm weather the velocity of the wind as felt on board, the rate of the ship being simultaneously taken from the water-log, to be described in the sequel. When performing these determinations, the greatest care must be taken to ascertain that the air is quite calm during registration. A good proof is afforded by not even the faintest breath of air curling the surface of the sea. But this sign must be of some duration, to give perfect certainty, since the first puffs of wind pass over the surface of the sea without producing the slightest visible effect. When the puffs of wind are on the beam, the observer has a sure sign in the smoke from the funnel not passing straight aft.

The observations for determining the friction-coefficient of the anemometer were as follows: —

1877.

Date.	Log. Naut. Miles an Hour.	Log. Metres per Second.	Anemometer. Metres per Second.	Anemometer. Friction-Coefficient.
June 15	7.7	4.0	2.5	+ 1.5
„ 30	7.2	3.7	2.1	1.6
„ „	7.3	3.8	2.2	1.6
July 15	7.0	3.6	1.7	1.9
Mean				1.65

Da en Sammenligning den 12te Juni mellem den nye Vindmaaler og den ældre gav den første en Frictionscoefficient af 1.4, har jeg for 1877 regnet med Coefficienten + 1.6.

1878.

Datum.	Log. Kvartmil i Timen.	Log. Meter pr. Secund.	Vindmaaler. Meter pr. Secund.	Vindmaaler. Frictions-Coefficient.
Juni 18	7.1	3.7	2.55	+ 1.15
Juli 5	6.7	3.5	2.3	1.2
„ „	7.0	3.6	2.4	1.2
„ 20	7.0	3.6	2.4	1.2
„ „	7.0	3.6	2.35	1.25
Aug. 30	6.5	3.4	2.45	0.95
Middel				+ 1.16

For 1878 har jeg antaget Coefficienten til + 1.2.

Dersom man før Registreringen stillede Viseren paa det Tal, der angiver Frictionscoefficienten, vilde man efter 30 Secunders Registrering kunne aflæse directe Vindens Hastighed i Meter pr. Secund. Paa vor Expedition stilledes altid Viseren paa 0, da det paa Forhaand ikke kunde garanteres, at Frictionscoefficienten holdt sig constant.

Skibets Kurs observeredes efter det samme Compas som Vindens Retning og noteredes paa hele Grader. Compassets Deviation var altid nøje kjendt, efter de Iagttagelser og Beregninger, som vare udførte af Captein Wille. Skibet svingedes for Deviation i 1876 i Husø, ved Sognefjordens Munding, i 1877 i Husø før Rejsens Begyndelse og i Vestfjorden ved dens Slutning, i 1878 i Bergen, udenfor Vardø, udenfor Hammerfest, ved Beeren Eiland, i Grønlandshavet, ved Spidsbergens Sydkap og under Grønlandsisen Vest for Spidsbergen.

Da Deviationens Størrelse var merkelig afhængig af den geografiske Position i de Farvande, som Expeditionen besøgte i 1878, var det nødvendigt ved Beregningen af Vindens og Skibets Retning at tage Hensyn hertil. Af Capt. Wille modtog jeg til dette Øjemed to af ham udarbejdede grafiske Fremstillinger, nemlig 1° et Kart over den i 1878 gjennemsejlede Del af Havet, paa hvilket var optrukket Linier for ligestore Værdier af den i Formelen for Compassets Deviation benævnte Coefficient B, der omtrentlig angiver Deviationens Maximumsværdi, og 2° en Række Deviationscurver (Argument: anlagt Kurs efter Compasset, Function: Deviationens Størrelse i Grader) betegnede med forskjellige Farver og ordnede paa samme Plade med fælles Kursargument samt optrukne for forskjellige bestemte Værdier af Coefficienten B. For enhver paaværende Plads kunde saaledes af Kartet No. 1 udtages Værdien af B og med denne samt anlagt Kurs pr. Compas kunde af No. 2 udtages den tilsvarende Værdi af

A comparison, on the 12th of June, between the new and the old anemometers, having indicated according to the latter, a friction-coefficient of 1.4, I computed for 1877 with the friction-coefficient + 1.6.

1878.

Date.	Log. Naut. Miles an Hour.	Log. Metres per Second.	Anemometer. Metres per Second.	Anemometer. Friction-Coefficient.
June 18	7.1	3.7	2.55	+ 1.15
July 5	6.7	3.5	2.3	1.2
„ „	7.0	3.6	2.4	1.2
„ 20	7.0	3.6	2.4	1.2
„ „	7.0	3.6	2.35	1.25
Aug. 30	6.5	3.4	2.45	0.95
Mean				+ 1.16

For 1878, I adopted the coefficient + 1.2.

If, before registration, the index were adjusted to the cipher indicating the friction-coefficient, the observer, after registering 30 seconds, could read off at once the velocity of the wind in metres per second. On our Expedition, however, the index was always adjusted to zero, since beforehand it is impossible to tell with certainty whether the friction-coefficient will remain unchanged.

The *Ship's Course* was observed by the same compass as the direction of the wind, and noted in whole degrees. The deviation of the compass was at all times accurately known, from Captain Wille's observations and computations. In 1876, the ship was swung for deviation at Husø, at the mouth of the Sognefjord; in 1877, at Husø, before the commencement of the cruise, and in the Vestfjord at its termination; in 1878, at Bergen; off Vardø; off Hammerfest; at Beeren Eiland; in the Greenland Sea; off Cape South, Spitzbergen; and at the Greenland ice barrier, west of Spitzbergen.

The amount of deviation being perceptibly dependent on the geographical position of the vessel in the tracts of ocean visited by the Expedition in 1878, it was necessary when computing the direction of the wind and of the ship, to take this circumstance into account. Captain Wille provided me with two diagrammatic representations, which he had specially prepared for that purpose, viz. 1, a chart of the tract of ocean explored by the Expedition in 1878, on which were lines indicating equal values of the coefficient B in the formula for the deviation of the compass, which coefficient approximates the maximum value of the deviation; and 2, a series of deviation-curves (abscissae: course by compass; ordinates: deviation expressed in degrees) marked with different colours and arranged on the same Plate, according to common course-abscissæ, for different definite values of the coefficient B. Hence, for each position of the ship, the value of B could be found on chart 1, and, with this value and the course by compass, the corresponding

Vandloggen er, som man ser, en speciel Anvendelse af *Pitot's Rør*. Kaldes den Højde, hvortil Vandet stiger i Stigerøret over det Niveau, det indtager, naar Fartøjet ligger stille, *h*, Skibets Hastighed *v*, Tyngdens Acceleration *g* og er *M* en Coefficient, saa har man[1]

$$h = M \frac{v^2}{2g}$$

Coefficienten *M* har efter Dubuats Forsøg en Værdi, der er større end 1, men bliver mindre, naar Hastighederne bliver større, uden dog at naa Enheden. Ved en Hastighed af $1.^m8$ pr. Secund fandtes $M = 1.08$.

Ved Vandloggen, saaledes som den er indrettet af Lieutenant Petersen, er Coefficienten *M* sat lig 1. Rigtigheden eller Tilstrækkeligheden af denne Antagelse til ethvert praktisk Brug tilsøs, selv paa lange Rejser, er godtgjort ved den Anvendelse, Apparatet har havt paa "Vøringen" under 1877 og 1878 Aars Expeditioner og under dens Gang i Fragtfart paa Østersøen og Spanien, hvor lange Strækninger er udsejlede uden Afbrydelse. Endvidere har det samme Resultat vist sig af Vandloggens Anvendelse paa Opløodningsdampskibet "Hansteen" hvert Aar siden 1875 og paa Korvetten "Nornen" paa et Togt til Vestindien. Sættes Coefficienten *M* lig 1, Kvartmilen lig $^1/_{60}$ af en Ækvatorsgrad og *g* lig $9.^m810$ (50° N. Br.), saa faar man den følgende Tabel for Skalaens Inddeling.

The water-log is obviously a special adaptation of *Pitot's tube*. Let *h* be the height to which the water in the upper tube rises above its level when the ship is stationary; *v* the speed of the vessel; *g* the acceleration of gravity; and *M* a coefficient, — we shall then have the formula[1]

$$h = M \frac{v^2}{2g}$$

The coefficient *M* has, according to Dubuat, a value greater than 1, which diminishes however with increasing velocities, though without reaching unity. For a velocity of $1.^m8$ per second, the value of *M* was found to be 1.08.

For the water-log on Lieutenant Petersen's construction, the coefficient *M* is put equal to 1. And this is practically correct, even for comparatively long voyages, as shown from experience derived on the cruises of the "Vøringen" in 1877 and 1878, and on her voyages in the freight-trade to the Baltic and to Spain, very considerable distances having then been run at a stretch. Equally favourable results have been obtained, too, by the use of the water-log (since 1875) on board the Coast Survey steamer "Hansteen," and on a cruise of the steam-corvette "Nornen" to the West Indies. Now, supposing the coefficient *M* to equal 1, a mile to equal $^1/_{60}$ of an equatorial degree, and *g* to equal $9.^m810$ (in lat. 50° N.), we have the following series of figures for graduating the scale.

Fart. (*Speed.*)	Skala. (*Scale.*)			Fart. (*Speed.*)	Skala. (*Scale.*)		
Kvartmil i Timen. (*Miles an Hour.*)	Meter. (*Metres.*)	Norske Fod. (*Norw. Feet.*)	Eng. Fod. (*Eng. Feet.*)	Kvartmil i Timen. (*Miles an Hour.*)	Meter. (*Metres.*)	Norske Fod. (*Norw. Feet.*)	Eng. Fod (*Eng. Feet.*)
1	0.014	0.043	0.044	7	0.663	2.114	2.176
2	0.054	0.172	0.178	7.5	0.761	2.427	2.498
2.5	0.085	0.270	0.278	8	0.866	2.761	2.842
3	0.122	0.388	0.400	8.5	0.978	3.117	3.209
3.5	0.166	0.529	0.544	9	1.096	3.495	3.597
4	0.217	0.690	0.711	9.5	1.222	3.894	4.008
4.5	0.274	0.874	0.899	10	1.354	4.314	4.441
5	0.338	1.079	1.110	10.5	1.492	4.756	4.896
5.5	0.410	1.305	1.343	11	1.638	5.220	5.373
6	0.487	1.553	1.599	11.5	1.790	5.706	5.873
6.5	0.572	1.823	1.876	12[2]	1.949	6.213	6.395

[1] Bresse, Cours de mécanique appliquée. Seconde partie, p. 335.
[2] Ved 80° Bredde med $g = 9.^m830$ bliver Skalastregen for 12 Miles Fart 1.945 Meter, altsaa kun 4^{mm} forskjellig fra Tabellens. For de mindre Hastigheder bliver Forskjellen forholdsvis mindre.

[1] Bresse, Cours de mécanique appliquée. Seconde partie, p. 335.
[2] In lat. 80° N., where $g = 9.^m830$, the division on the scale denoting a speed of 12 knots will correspond to $1.^m945$, and thus exhibit a difference of only 4^{mm} as compared with the figures in the Table. For less velocities, the difference will be proportionally reduced.

Vil man efterse, om Røret gjennem Bunden er i Orden, stænges Kranen *d*, Pakningsstykket *f* afskrues, og Blyrøret bøjes noget til Side; man løsner paa Pakningsringen *c*, Røret *a* løftes op, indtil dets nedre Ende har passeret Kranen paa Røret *b*, hvorefter denne afstænges, og Røret *a* kan løftes helt op og eftersees.

Ved Brugen af Vandloggen maa to Ting haves i Erindring:

1) at Skalaens Nulpunkt eller rettere Snorens Længde fra Flyderen til Vægten, der tjener til Viser paa Skalaen, retter sig efter Skibets Dybgaaende, og

2) Fejlen, der foraarsages ved stadig Krængning.

Med Hensyn til det første Punkt, reguleres dette lettest derved, at man standser Skibets Fart, udtager Trækilen og flytter Loddet paa Nul. Det hele kan udføres i nogle Minuter. Ved de hyppige Stopninger, som Lodning og Skrabning foranledigede, kunde vi paa Nordhavs-Expeditionen altid holde Vandloggen skarpt justeret. Paa Sejlskibe vil Forbruget ombord ikke saaledes forandre Dybgaaendet, som paa Dampskibe, men man bør dog imellem foretage et Par nøjagtige Logninger med den almindelige Log og Uhr, for at kontrollere Vandloggen og eventuelt justere den paany.

Med Hensyn til det andet Punkt, Krængningsfejlen, da kommer denne i Betragtning kun ved større og stadig Krængning. Slingringernes Virkning er næsten ganske hævet ved Hullets Tranghed og Blænderen. Antages at Stigerøret staar midskibs og verticalt, naar Skibet ligger paa ret Kjøl, og sættes den lodrette Afstand fra Havniveauet til det Punkt, om hvilket Fartøjet drejer sig, naar det begynder at krænge, lig x, regnet positiv fra Havniveauet nedad mod Kjølen, samt Krængningsvinkelen i og den under denne Krængning paa Skalaen aflæste Fart v', saa har man, idet de tidligere Benævnelser h og v beholdes:

To ascertain whether the tube passing through the ship's bottom be in order, the stop-cock *d* is turned back, the gland *f* screwed off, and the leaden tube bent a little aside; then, after partially unscrewing the gland *c*, the tube *a* is lifted up till its lower extremity is just clear of the cock of the tube *b*, and when this too has been turned back, the tube *a* may be taken out and examined.

When using the water-log, two things must be borne in mind, viz. —

1. That the position of zero on the graduated scale, or rather the length of the line from the float to the weight that plays against the scale, is regulated by the draught of the ship; and
2. The heeling error.

As regards the first source of error, the index is best regulated by stopping the vessel, and then, after taking out the wooden wedge, adjusting the weight to zero. This may be done in a few minutes. With the frequent stoppages involved in sounding and dredging on the North-Atlantic Expedition, we could always manage to keep the water-log accurately adjusted. In sailing-vessels the draught is not, of course, as in steamers, affected by the consumption of coal; but now and then the speed should nevertheless be closely determined with the common log, as a means of testing the results of the water-log, and, if necessary, of adjusting that instrument anew.

The other source of error, viz. heeling, may be ignored altogether, save when the heeling is both great and continuous. The effect of rolling on the water-log will, as a rule, be almost wholly counteracted by the narrowness of the aperture of the tube, and by the blind. Supposing the upper tube, placed amidships, to have a vertical position when the ship is on an even keel, then, if x be the length of the perpendicular from the level of the sea to the point about which she turns on beginning to heel, — assumed positive from the level of the sea towards the keel, — i the heeling angle, and v' the speed, as read off on the scale with the vessel at that angle, we have, h and v denoting as before. —

$$v'^2 = 2g\left(\frac{h+x}{\cos i} - x\right) = \frac{2gh + 2gx}{\cos i} - 2gx = \frac{v^2 + 2gx\,(1 - \cos i)}{\cos i}$$

$$v^2 = v'^2 \cos i - 4gx \sin^2 \frac{i}{2}$$

x, v og v' maa regnes i samme Enhed (Meter, Fod), Tidsenhed er Secundet. 1 Kvartmil i Timen svarer til 0.5153 Meter pr. Secund.

Den følgende Tabel giver en Oversigt over Resultaterne efter denne Formel. Den er beregnet for en Krængning $i = 20^0$, og efter Værdierne af $x = 0$, $x = +1^m$ og $x = -1^m$.[1]

The value of x, v, and v' must be taken in the same unit of measure (metre, foot). The unit of time is a second. One mile an hour corresponds to 0.5153 metre per second.

The following Table gives the results obtained by this formula, taking 20^0 as the angle of heel, and with the values $x = 0$, $x = +1^m$, and $x = -1^m$.[1]

[1] Værdien af x kan findes, naar man krænger Fartøjet, medens det ligger stille, og observerer Krængningsvinkelen i samt Længden o

[1] The value of x may be found by heeling the ship when stationary, and then observing the angle of heel i, together with the

Krængning 20°. *Angle of Heel* 20°.

Observeret Fart. (*Observed Speed.*) Kvartmil i Timen. (*Miles an Hour.*) v'	Virkelig Fart. (*Actual Speed.*) $x = 0$. v	Corr. (*Corr.*)	Diff. f. 1 Kvartmil. (*Diff. for 1 Mile.*)	v Kvartmil i Timen. (*Miles an Hour.*) $x = +1^m$. v	Corr.	$x = -1^m$. v	Corr
12.0	11.6	—0.4	0.03	11.4	—0.6	11.8	—0.2
9.0	8.7	—0.3	0.03	8.5	—0.5	9.0	0.0
6.0	5.8	—0.2	0.03	5.4	—0.6	6.2	+0.2
4.0	3.9	—0.1	0.03	3.3	—0.7	4.4	+0.4
3.0	2.9	—0.1	0.03	2.0	—1.0	3.6	+0.6
2.5	2.4	—0.1	0.03	1.2	—1.3	3.2	+0.7
2.2	2.1	—0.1	0.03	0.4	—1.8	3.0	+0.8
2.177	2.1	—0.1	0.03	0.0	—2.2	3.0	+0.8
1.0	1.0	0.0				2.3	+1.3

Man ser, at Krængningsfejlen, selv med en saa stor Krængning som 20°, for de større Farter kun udgjør Brøkdele af en Knobs Fart. Svinger Fartøjet om et Punkt i eller nær Vandliniens Flade, er Krængningsfejlene i ethvert Tilfælde meget smaa.

Anderledes stiller Forholdet sig, dersom Stigerøret ikke staar midtskibs. Der kommer da under Krængning en ny Korrektion til, som bliver positiv for Krængning til den ene Side og negativ for Krængning til den anden, og hvis Størrelse voxer med Stigerørets Afstand fra Diametralplanet.

Efter vor Erfaring viste Vandloggen sig særdeles hensigtsmæssig og holdtes med største Lethed i Orden. Et Blik ned i Maskinskylightet var nok til at observere Skibets Fart i Øjeblikket. Maskinisten kunde under Skrabning og Trawling holde Skibet gaaende med den befalede Fart. Til Reduction af de observerede Vindretninger og Vindhastigheder til sande kræves Skibets Hastighed i Observationsøjeblikket. Denne observeredes paa Vandloggen, der saaledes er et udmærket nautisk-meteorologisk Apparat."

It is evident that, with greater speed, the error involved in heeling, even at an angle of 20°, will amount to only a fraction of a mile. And if the point about which the vessel turns lie in or near the plane of the water-line, the error will be generally very small.

The case, however, is different in the event of the upper tube not being amidships. Another correction, positive with a heel to the one side, negative with a heel to the other, will then be needed for computing the speed, and the effect of the heeling will increase with the distance of the upper tube from amidships.

So far as our experience went, we had every reason to be satisfied with the water-log; it answered excellently, and was easy to keep in order. A glance down the engine-room skylight sufficed to tell the ship's speed. Hence, in dredging or trawling the engineer could keep the vessel at the exact rate required. For reducing observations of the wind's direction and velocity to their true value, the speed of the vessel at the moment of observation has to be found. Now, this we took from the water-log, which accordingly proved an excellent instrument for meteorological work at sea."

af det Stykke, Vandets Overflade har flyttet sig fra det oprindelige Niveau i Røret. Ligger Niveauet under Krængningen højere, det er over Nulpunktet (Loddet paa Tal paa Skalaen), er x positiv, ligger det lavere (Loddet ovenfor Nulpunktet paa Skalaen), er x negativ. Formelen er:

$$x = o \frac{\cos i}{2 \sin^2 \frac{i}{2}}$$

Ex. $i = 20°$, $o = 0.^m05$, $x = 0.^m779$.

Den negative Værdi af x lig en hel Meter er medtaget som Regneexempel for at vise Virkningen af en saadan, omendskjønt den ikke vil forekomme i Praxis.

distance o, through which the water in the tube has moved from its original level. If the level in heeling be higher, i. e. above zero (the weight within the divisions of the scale), the value of x will be positive; if lower (the weight above zero), x will be negative. The formula is as follows: —

$$x = o \cdot \frac{\cos i}{2 \sin^2 \frac{i}{2}}$$

Example: $i = 20°$, $o = 0.^m05$, $x = 0.^m779$.

The negative value of x put equal to a whole metre, is introduced merely by way of example, to show its *possible* effect, the case never occurring in practice.

Medens saaledes i 1877 og 1878 Skibets Hastighed i Observationsøjeblikket kunde bestemmes med al ønskelig Nøjagtighed, var dette ingenlunde Tilfældet i 1876. Saa ofte der loggedes med den almindelige Log paa samme Tid som de meteorologiske Observationer toges, erholdt man den forønskede Nøjagtighed i Bestemmelsen af Skibets Fart. Men denne Log benyttedes forholdsvis sjelden. Patentloggen, der viser udløben Distance, giver kun under jevn Fart et Maal for Hastigheden i Øjeblikket. Man var saaledes ofte henvist til at bedømme Skibets Fart ved Skjøn, og søgte at corrigere dette ved en senere Aflæsning af Patentloggen eller ved de paa astronomisk Vej fundne Positioner. Fejlen i Bestemmelsen af Skibets Fart kan saaledes vistnok i enkelte Tilfælder gaa op til 1 til 2 Kvartmil i Timen eller 0.5 til 1 Meter i Secundet og derved blive af samme Orden som Usikkerheden ved de samme Aar med Vindmaaleren bestemte Vindhastigheder.

Naar Skibet bevæger sig gjennem Luften, virker dets Bevægelse som en Modvind, der sammen med Luftens virkelige Bevægelse har en Resultant, som er den Luftbevægelse, der føles og maales ombord. Beregningen af den sande Vindretning og sande Vindhastighed kan gjøres paa følgende Maade.

Kaldes:

y den observerede Vinkel mellem Vindretningen ombord og Diametralplanet, eller den observerede Vindretning p. C. ombord minus Kurs p. C.

v Skibets Fart, regnet i modsat Retning af dets Bevægelse (Kurs),

w den ombord med Vindmaaler maalte Vindhastighed,

u den virkelige Vindretnings Vinkel med Diametralplanet,

W den virkelige Vindhastighed,

e Vinkelen mellem den observerede og den virkelige Vindretning,

saa har man Ligningerne

$$W \sin u = w \sin y \qquad (1)$$

$$W \cos u = w \cos y - v \qquad (2)$$

$$\text{cotang } u = \frac{w \cos y - v}{w \sin y} \qquad (3)$$

$$W = \sqrt{w^2 + v^2 - 2wv \cos y} \qquad (4)$$

Naar $y = o$, det er Vinden ombord føles ret forind, har man 2 Tilfælder:

1° $y = o$, $u = o$, det er, den virkelige Vind stik i Stevn, da er

$$W = w - v \qquad (5)$$

2° $y = o$, $u = 180°$, det er den virkelige Vind ret agterind, da er

$$W = v - w \qquad (6)$$

Naar $y = 180°$, det er, Vinden ombord føles ret agterind, har man kun 1 Tilfælde, nemlig:

Thus, whereas in 1877 and 1878 the rate of the ship could be determined with all desirable accuracy at the moment of observation, such was by no means the case in 1876. Whenever the common log was used and meteorological observations taken simultaneously, we could obtain the required accuracy for determining the speed of the vessel; but this log was used comparatively seldom. The patent log, which shows the distance run, does not give a measure of the rate at the moment of observation, unless the speed be uniform. Hence, we had often to estimate the rate of the vessel, and then try to correct the result by a subsequent reading of the patent log or by means of astronomically found positions. The error in the determination of the ship's speed can, for 1876, therefore, in some cases amount to as much as 1 to 2 miles an hour, or 0.5 to 1 metre per second, and accordingly rise to the same order as the inaccuracy attaching to the velocity of the wind determined the same year with the anemometer.

The motion of a ship moving through the air acts as a head wind, which, together with the true motion of the air, produces as resultant the motion of the air as felt and measured at the place of observation on board. The computation of the true direction and velocity of the wind can be effected in the following manner: —

If

y be the observed angle subtending between the direction of the wind on board and the fore and aft line, or the observed direction of the wind on board p. C. minus the course p. C.;

v the speed of the ship taken in the opposite direction of her motion (course);

w the velocity of the wind on board as measured with the anemometer;

u the angle subtending between the true direction of the wind and the fore and aft line;

W the true velocity of the wind;

e the angle subtending between the observed and the true direction of the wind;

then we have the following equations: —

$$W \sin u = w \sin y \qquad (1)$$

$$W \cos u = w \cos y - v \qquad (2)$$

$$\text{cotang } u = \frac{w \cos y - v}{w \sin y} \qquad (3)$$

$$W = \sqrt{w^2 + v^2 - 2wv \cos y} \qquad (4)$$

If $y = o$, i. e. the wind on board is felt to blow right ahead, we have 2 cases: —

1° $y = o$, $u = o$, i. e., the true wind comes right ahead, and then

$$W = w - v;$$

2° $y = o$, $u = 180°$, i. e., the true wind comes right aft, and then

$$W = v - w.$$

If $y = 180°$, i. e., the wind on board is felt to blow right aft, we have only 1 case, viz.: —

3^0 $y = 180^0$, $u = 180^0$ og $W = w + v$. (7)

Ligger Fartøjet stille, det er $v = o$, bliver

$u = y$ og $W = w$. (8)

For at undersøge, hvilke Fejl i den beregnede Vindretning og Vindhastighed der foraarsages af smaa Fejl i de observerede Størrelser, differentiere vi Ligningerne (1) og (2).

Vi faa da

$$\sin u\, dW + W \cos u\, du = \sin y\, dw + w \cos y\, dy. \quad (9)$$

$$\cos u\, dW - W \sin u\, du = \cos y\, dw - dv - w \sin y\, dy. \quad (10)$$

Multipliceres den første af disse Ligninger med $\sin u$, den anden med $\cos u$ og adderes, faar man den følgende Ligning (11). Multipliceres den første Ligning med $\cos u$, den anden med $-\sin u$ og adderes, faar man den følgende Ligning (12).

$$dW = \cos(u-y)\, dw - \cos u\, dv + w \sin(u-y)\, dy. \quad (11)$$

$$W du = -\sin(u-y)\, dw + \sin u\, dv + w \cos(u-y)\, dy. \quad (12)$$

Da $e = u - y$, kan man i Ligningerne (11) og (12) indføre e istedetfor y. Endvidere har man

$$\sin e = \frac{v}{W} \sin y = \frac{v}{w} \sin u. \quad (13)$$

Vi ville nu opsøge de Tilfælder, i hvilke en liden Forandring af en bestemt Størrelse i de observerede Værdier frembringer den største Forandring i de beregnede Værdier. Vi tage saaledes de enkelte Differentialforhold for os, idet de øvrige Størrelser, hvormed der regnes, ansees for constante.

1. $\frac{dW}{dw} = \cos(u-y) = \cos e.$

Maximum haves, naar $e = 0$ eller $e = 180^0$, altsaa i alle de 3 Tilfælder, som ere anførte under (5), (6) og (7). Maximumsværdien er 1 eller $dW = \pm dw$. Den beregnede Vindhastighed faar i det højeste den samme Fejl som den observerede.

2. $\frac{dW}{dv} = -\cos u.$

Maximum haves, naar $u = 0$ eller 180^0 og Værdien er ± 1, altsaa som i foregaaende Tilfælde. Fejlen i Loggen gaar i det Højeste med sin egen Værdi over paa den beregnede Vindhastighed.

3. $\frac{dW}{dy} = w \sin(u-y) = w \sin e = w \frac{v}{W} \sin y = v \sin u.$

Her indtræffe 3 Tilfælder, eftersom Skibets Fart er større eller mindre end eller lig den ombord maalte Vindhastighed.

1. Er $v > w$, kan e være 90^0. I dette sidste Tilfælde er $\sin u = \cos y = \frac{w}{v}$, altsaa mindre end 1. Maximum haves saaledes, naar $e = 90^0$, og Maximumsværdien bliver lig w eller

3^0 $y = 180^0$, $u = 180^0$ and $W = w + v$. (7)

Supposing the vessel lying still, i. e. $v = o$, then

$u = y$, and $W = w$. (8)

To find what errors in the computed direction and velocity of the wind result from small errors in the observed quantities, we have to differentiate the equations (1) and (2).

This gives —

$$\sin u\, dW + W \cos u\, du = \sin y\, dw + w \cos y\, dy. \quad (9)$$

$$\cos u\, dW - W \sin u\, du = \cos y\, dw - dv - w \sin y\, dy. \quad (10)$$

Multiplying the first of these equations by $\sin u$, the second by $\cos u$, and adding, we get the following equation (11). Multiplying the first equation by $\cos u$, the second by $-\sin u$, and adding, we get the following equation (12).

$$dW = \cos(u-y)\, dw - \cos u\, dv + w \sin(u-y)\, dy. \quad (11)$$

$$W du = -\sin(u-y)\, dw + \sin u\, dv + w \cos(u-y)\, dy. \quad (12)$$

Since $e = u - y$, in place of y, e may be introduced into the equations (11) and (12). Moreover,

$$\sin e = \frac{v}{W} \sin y = \frac{v}{w} \sin u. \quad (13)$$

We will now investigate in what cases a slight change of a definite magnitude in the observed values, will produce the greatest possible change in the computed values. Accordingly, we examine the various differential coefficients, all other quantities that enter into the computation being regarded as constant.

1. $\frac{dW}{dw} = \cos(u-y) = \cos e.$

The maximum is reached when $e = 0$, or $e = 180^0$; accordingly, in each of the 3 cases specified above, viz. (5), (6), and (7). The maximum value is 1, or $dW = \pm dw$. The error attaching to the computed velocity of the wind cannot exceed that of the observed velocity.

2. $\frac{dW}{dv} = -\cos u.$

The maximum is reached when $u = 0$, or 180^0, and the value amounts to ± 1; accordingly, the same as in the foregoing case. The error of the log enters at most with its own value into the computed velocity of the wind.

3. $\frac{dW}{dy} = w \sin(u-y) = w \sin e = w \frac{v}{W} \sin y = v \sin u.$

Here we have three cases, according as the speed of the ship is greater or less than or equal to the velocity of the wind as measured on board.

1. If $v > w$, then e can be 90^0. In this last case $\sin u = \cos y = \frac{w}{v}$, and is therefore less than 1. The maximum is reached accordingly when $e = 90^0$, and the value of the maximum $= w$, or

$$\text{Max. } dW = w \frac{\pi}{180} dy,$$

naar dy udtrykkes i Grader.

2. Er $v < w$, kan e ikke blive saa stor som 90°, men u kan blive 90°, i hvilket Tilfælde Maximum indtræffer med en Værdi lig v, eller, naar dy regnes i Grader,

$$\text{Max. } dW = v \frac{\pi}{180} dy.$$

3. Er $v = w$, er Betingelsen for Maximum, at samtidig $e = 90^\circ$ og $u = 90^\circ$; y bliver $= 0$ og $W = 0$, det er, naar Luften er ganske stille. Maximumsværdien af dW bliver $= wdy = vdy$.

Er $v = 0$, bliver $\frac{dW}{dy} = 0$, eller Fejlen i den beregnede Vindhastighed uafhængig af Fejlen i den maalte Vindretning.

Ex. 1. $v > 4$, $w = 4$, $dy = 5^\circ$. Max. $dW = 0.35$.
Ex. 2. $v = 5$, $w > 5$, $dy = 5^\circ$. Max. $dW = 0.44$.
Ex. 3. $v = 5$, $w = 5$, $dy = 5^\circ$. Max. $dW = 0.44$.

Ved et Fartøj, som gjør 10 Mils Fart ($v = 5$), foraarsager saaledes en Fejl af 5° ($^1/_2$ Streg) i den ombord observerede Vindretning en Fejl af kun henimod 0.5 Meter pr. Secund i den beregnede Vindhastighed.

Den største Fejl, som overhovedet bevirkes i den beregnede Vindhastighed af en Fejl i Bestemmelsen af Vindens Retning ombord, er alene afhængig af Skibets Fart, ikke af Vindens Hastighed. En Fejl af 1 Streg ($11.^\circ 25$) i y giver en Fejl af 0.1963 Meter pr. Secund for hver Meters Fart, Skibet gjør i Secundet, eller med runde Tal en Fejl af $^1/_{10}$ Meter pr. Sec. for hver Knobs Fart, Skibet gjør — naar den ombord observerede Vindhastighed er større end Skibets Fart. Er den mindre, bliver Fejlen mindre i Forhold til den maalte Vindhastighed.

$$\text{Max. } dW = w \frac{\pi}{180} dy,$$

assuming dy to be expressed in degrees.

2. If $v < w$, then e cannot amount to 90°, whereas u can reach 90°, in which case the maximum will have a value equal to v, or, expressing dy in degrees,

$$\text{Max. } dW = v \frac{\pi}{180} dy.$$

3. If $v = w$, the condition for reaching the maximum is that e and u shall simultaneously equal 90°; y will then equal 0 and W 0, i. e. when the air is quite calm. The maximum value of $dW = wdy = vdy$.

If $v = 0$, then $\frac{dW}{dy} = 0$, or, the error in the computed velocity of the wind independant of the error in the measured direction.

Ex. 1. $v > 4$, $w = 4$, $dy = 5^\circ$. Max. $dW = 0.35$.
Ex. 2. $v = 5$, $w > 5$, $dy = 5^\circ$. Max. $dW = 0.44$.
Ex. 3. $v = 5$, $w = 5$, $dy = 5^\circ$. Max. $dW = 0.44$.

Hence, with a vessel running 10 miles an hour ($v = 5$), an error of 5° (half a point) in the direction of the wind as observed on board, occasions an error of scarcely 0.5 metre per second in the computed velocity.

Generally, the greatest error that can result in the computed velocity of the wind from an error in the determination of the direction of the wind as felt on board, is solely dependent on the speed of the vessel, not on the velocity of the wind. An error of 1 point ($11.^\circ 25$) in y entails an error of 0.1963 metre per second for every metre run by the ship in a second, or, in round numbers, an error of one-tenth of a metre per second for every knot the vessel runs — provided the velocity of the wind as observed on board be greater than the speed of the ship; if less, the error will diminish in proportion to the measured velocity of the wind.

4. $$\frac{du}{dw} = -\frac{\sin(u-y)}{W} = -\frac{\sin e}{W} = -\frac{v.\sin y}{W^2} = -\frac{v.\sin y}{w^2 + v^2 - 2wv\cos y}.$$

Maximum haves, naar $\cos y = \frac{2wv}{w^2 + v^2}$ eller $\sin y = \pm \frac{w^2 - v^2}{w^2 + v^2}$; da er ogsaa $W = \frac{w^2 - v^2}{\sqrt{w^2 + v^2}}$ og $\sin u = \frac{w}{W} \sin y = \frac{w}{\sqrt{w^2 + v^2}}$, $\sin e = \frac{v}{W} \sin y = \frac{v}{\sqrt{w^2 + v^2}}$. Maximumsværdien af $\frac{du}{dw}$ bliver lig $\frac{v}{w^2 - v^2}$, eller, naar du regnes i Grader,

$$\text{Max. } du = \frac{v}{w^2 - v^2} \cdot \frac{180}{\pi} \cdot dw.$$

The maximum is reached when $\cos y = \frac{2wv}{w^2 + v^2}$, or $\sin y = \pm \frac{w^2 - v^2}{w^2 + v^2}$; and then $W = \frac{w^2 - v^2}{\sqrt{w^2 + v^2}}$ and $\sin u = \frac{w}{W} \sin y = \frac{w}{\sqrt{w^2 + v^2}}$, $\sin e = \frac{v}{W} \sin y = \frac{v}{\sqrt{w^2 + v^2}}$. The maximum value of $\frac{du}{dw}$ will be equal to $\frac{v}{w^2 - v^2}$, or, computing with du in degrees,

$$\text{Max. } du = \frac{v}{w^2 - v^2} \cdot \frac{180}{\pi} \cdot dw.$$

Exempel (*Example*) $v = 5$.

w	0	1	2	3	4	5	6	7	8	9	10	20ᵐ	per Sec.
y	90°	67.°4	46.°4	28.°1	12.°7	0°	10.°3	18.°9	26.°0	31.°9	36.°9	61.°9	
$\frac{du}{dw}$ max.	11.°5	11.°9	13.°6	17.°9	31.°8	∞	26.°0	11.°9	7.°3	5.°1	3.°8	0.°8	
W	5	4.7	3.9	2.7	1.4	0	1.4	2.8	4.1	5.4	6.7	18.ᵐ2	per Sec.
u	180°	168.°7	158.°2	149.°0	141.°3		50.°2	54.°5	58.°0	61.°0	63.°4	76.°0	
e	90°	101.°3	111.°8	121.°0	128.°7		39.°8	35.°6	32.°0	29.°1	26.°6	14.°0	

$$5. \quad \frac{du}{dv} = \frac{\sin u}{W} = \frac{w \sin y}{W^2} = \frac{w \sin y}{w^2 + v^2 - 2\,w\,v\,\cos y}.$$

Maximum haves, ligesom i foregaaende Tilfælde, naar

$$\cos y = \frac{2\,wv}{w^2 + v^2},$$

og Maximumsværdien er $\frac{w}{w^2 - v^2}$ eller

$$\text{Max. } du = \frac{w}{w^2 - v^2} \cdot \frac{180}{\pi}\, dv.$$

The maximum is reached, as in the foregoing case, when

$$\cos y = \frac{2\,wv}{w^2 + v^2},$$

and the maximum value is $\frac{w}{w^2 - v^2}$, or

$$\text{Max. } du = \frac{w}{w^2 - v^2} \cdot \frac{180}{\pi}\, dv.$$

Ex. $v = 5$.

w	0	1	2	3	4	5	6	7	8	9	10	20ᵐ	per Sec.
$\frac{du}{dv}$ max.	0°	2.°4	5.°5	10.°7	25.°5	∞	31.°2	16.°7	11.°7	9.°2	7.°6	3.°1	

$$6. \quad \frac{du}{dy} = \frac{w \cos(u - y)}{W} = \frac{w \cos e}{W} = \frac{w\,(w - v \cos y)}{w^2 + v^2 - 2\,wv \cos y}.$$

Maximum haves, naar $\sin y = 0$ og

Maximumsværdien er $\frac{w}{w - v}$, naar $y = 0$, $W = w - v$

$\frac{w}{w + v}$, naar $y = 180^0$, $W = w + v$.

Ex. $v = 5$, $y = 0$, det er Vinden ombord ret forind.

The maximum is reached when $\sin y = 0$, and

the maximum value is $\frac{w}{w - v}$ when $y = 0$, $W = w - v$

$\frac{w}{w + v}$ when $y = 180^0$, $W = w + v$.

Ex. $v = 5$, $y = 0$, i. e. the wind, as felt on board, being right ahead.

w	0	1	2	3	4	5	6	7	8	9	10	20ᵐ	per Sec.
$\frac{du}{dy}$ max.	0	$-1/4$	$-2/3$	$-3/2$	-4	∞	6	$7/2$	$8/3$	$9/4$	2	$4/3$	
W	5	4	3	2	1	0	1	2	3	4	5	15	

$v = 5$, $y = 180^0$, det er Vinden ombord ret agterind.

$v = 5$, $y = 180^0$, that is, the wind, as felt on board, being right aft.

$\frac{du}{dy}$ max.	0	$1/6$	$2/7$	$3/8$	$4/9$	$5/10$	$6/11$	$7/12$	$8/13$	$9/14$	$10/15$	$20/25$
W	5	6	7	8	9	10	11	12	13	14	15	25

Af Formlerne for du og af Exemplerne ser man, at Bestemmelsen af Vinkelen u bliver meget usikker, naar den virkelige Vindhastighed W er liden. I dette Tilfælde bør man derfor, istedetfor at beregne u, observere dens Værdi directe efter Smaabølgerne paa Søen, hvilket kan gjøres med omkring 1 Stregs Nøjagtighed. Til Control kan man beregne Vindhastigheden W efter en af de følgende Formler:

As appears from the formula for du and from the several examples, the determination of the angle u is very uncertain when the true velocity of the wind, W, is small. In that case, therefore, instead of computing u, it is best to observe its value direct from the small waves that curl the surface of the sea, which may be done with an accuracy of about 1 point. The result may be controlled by computing the velocity of the wind W by one of the following formulæ: —

$$W = w \frac{\sin y}{\sin u}, \quad W = v \frac{\sin y}{\sin(u-y)}, \quad W = \sqrt{w^2 - v^2 \sin^2 u} - v \cos u,$$

af hvilke dog ingen giver sikrere Resultat end Formel (4).

none of which, however, give a more trustworthy result than formula (4).

Den virkelige Vindhastighed, der danner Grænsen for de Tilfælder, i hvilke man bestemmer Vinkelen u nøjagtigere ved directe Observation end ved Beregning, kan findes saaledes:

Naar man regner med v, w og y har man

The true velocity of the wind, which gives the limit for such cases wherein the angle u can be determined with greater accuracy by direct observation than by computation, can be found as follows: —

Calculating with v, w, and y, we have

$$du = -\frac{\sin e}{W} \cdot \frac{180}{\pi} dw + \frac{\sin u}{W} \cdot \frac{180}{\pi} dv + \frac{w \cos e}{W} dy.$$

Den største Værdi af $\frac{du}{dw}$ faar man overhovedet, naar $e = \pm 90^0$, hvilket kun kan finde Sted, naar $W < v$. I dette Tilfælde bliver $W = \frac{180}{\pi} \cdot \frac{dw}{du} = W_m$. Sættes $dw = 0.5$ og $du = 11.^025$ (1 Streg), saa faar man $W_m = 2.5465$. Er W mindre end denne Værdi, vil man, naar $e = 90^0$, med $dw = 0.5$, faa $du > 11.^025$.

The greatest value of $\frac{du}{dw}$ is reached when $e = \pm 90^0$, which cannot occur unless $W < v$. In that case we have $W = \frac{180}{\pi} \cdot \frac{dw}{du} = W_m$. If we put $dw = 0.5$ and $du = 11.^025$ (1 point), W_m will be $= 2.5465$. Supposing the value of W to be less, the result, with $dw = 0.5$, will, when $e = 90^0$, be $du > 11.^025$.

Er $v < W$, kan e ikke naa Værdien 90^0, og man faar, i ugunstigste Tilfælde ($W = 2.55$) du ikke større end $11.^025$. Naar $y = 90^0$, bliver $\sin e$ størst, nemlig lig $\frac{v}{W}$ og Max. $du = \frac{v}{W^2} \cdot \frac{180}{\pi} dw$, hvilket, naar $v = 2.55$, netop naar op til $11.^025$.

If $v < W$, e cannot attain the value of 90^0, and then, in the most unfavourable case ($W = 2.55$), du will not be greater than $11.^025$. When $y = 90^0$, $\sin e$ will be greatest, viz. equal to $\frac{v}{W}$, and Max. $du = \frac{v}{W^2} \cdot \frac{180}{\pi} dw$, which, when $v = 2.55$, exactly reaches $11.^025$.

Den største Værdi af $\frac{du}{dv}$ faar man, naar $u = \pm 90^0$, og den bliver lig $\frac{1}{W} \cdot \frac{180}{\pi}$. Med $du = 11.^025$ og $dv = 0.2$, findes $W = 1.018$. Er W større, bliver altid $du < 11.^025$.

The greatest value of $\frac{du}{dv}$ is reached when $u = \pm 90^0$ and becomes equal to $\frac{1}{W} \cdot \frac{180}{\pi}$. With $du = 11.^025$ and $dv = 0.2$, W will be equal to 1.018. If W be greater, du will always be $< 11.^025$.

Den største Værdi af $\frac{du}{dy}$ faar man, naar $e = 0$ eller 180^0. I dette Tilfælde er den største Værdi af $w = W + v$, nemlig naar $u = 0^0$, $y = 0$, $e = 0$.

The greatest value of $\frac{du}{dy}$ is reached when $e = 0$, or 180^0. In that case, the greatest value of $w = W + v$, viz. when $u = 0^0$, $y = 0$, $e = 0$.

Man har da, naar Grændseværdien for W kaldes W_m,

$$W_m = w\frac{dy}{du} = (W_m + v)\frac{dy}{du}$$

og heraf $W_m = v\frac{dy}{du - dy}$.

Af denne Formel ser man, at Vinkelen u i det foreliggende ugunstigste Tilfælde ikke kan bestemmes med samme Nøjagtighed som Vinkelen y. Thi W_m bliver uendelig, naar $du = dy$. Som rimelige Grændser for Nøjagtigheden kan sættes $dy = \pm 5^0$ og som i ovenstaaende Exempler $du = \pm$ 1 Streg $= \pm 11.^025$. Man faar da $W_m = \frac{5}{6.25}v = 0.8v$. Da "Vøringens" Fart i stille Vejr i det høieste var 8 Kvartmil i Timen eller 4^m pr. Sec., bliver for dette Fartøj $W_m = 3.^m2$ pr. Sec. Er v mindre end 4^m eller W større end $3.^m2$, vil, naar $dy = \pm 5^0$, du altid blive *mindre* end $\pm 11.^025$.

Den Grænse, som den virkelige Vindhastighed maa overskride, dersom det skal medføre større Nøjagtighed at bestemme Vinkelen u ved Beregning end ved directe Observation (der neppe kan gjøres nøjagtigere end paa 1 Streg), er saaledes, da Fejlen i Loggen spiller en liden Rolle, væsentlig afhængig af Nøjagtigheden af Maalingen af Vindens Hastighed med Vindmaaleren og i endnu højere Grad af Skibets Hastighed. Til Oversigt hidsættes følgende 2 smaa Tabeller.

Hence, if we term the said limit for W W_m

$$W_m = w\frac{dy}{du} = (W_m + v)\frac{dy}{du}$$

and therefore $W_m = v\frac{dy}{du - dy}$.

From the given formula it appears that the angle u in this, the most unfavourable case cannot be determined with an accuracy equal to that of the angle y. For, W_m becomes infinite when $du = dy$. As practical limits for the accuracy attainable, dy may be put equal to $\pm 5^0$, and, as shown in the foregoing examples, $du = \pm$ 1 point $= \pm 11.^025$. Accordingly, we get $W_m = \frac{5}{6.25}v = 0.8v$. Now, the speed of the "Vøringen" in calm weather never exceeding 8 miles an hour, or 4^m per second, with that vessel W_m will be equal to $3.^m2$ per second. If v be less than 4^m or W greater than $3.^m2$, du will, when $dy = \pm 5^0$, be always *less* than $\pm 11.^025$.

The limit which the true velocity of the wind must exceed to admit of greater accuracy in computing the angle u than in determining it by direct observation (with the latter method the limit of accuracy can hardly be less than 1 point), is, therefore, since the error in the indication of the log is of little influence, chiefly dependent on the accuracy with which the velocity of the wind is measured with the anemometer, and in a still higher degree on the speed of the vessel. This will be seen at a glance from the two following Tables.

$$W_m = \frac{180}{\pi}\cdot\frac{dw}{du};\ \begin{cases} e = 90^0 \\ W < v \end{cases}$$

dw	du	W_m
1^m	$11.^025$	5.1
0.5	11.25	2.5
0.2	11.25	1.0
1^m	5^0	11.5
0.5	5^0	5.7
0.2	5^0	2.3

$$W_m = v\frac{dy}{du - dy};\ \begin{cases} e = 0 \\ u = 0 \\ y = 0 \end{cases};\ w = W + v.$$

dy	du	v	W_m
5^0	$11.^025$	0	0
5	11.25	1	0.8
5	11.25	2	1.6
5	11.25	5	4.0
5	11.25	8	6.4
5	11.25	10	8.0

Til Sammenligning hidsættes de første Grader af Beauforts Scala og deres tilsvarende Vindhastigheder.

For comparison are appended the first degrees of Beaufort's scale, with the corresponding wind-velocities.

Beaufort Scala. (*Beaufort Scale.*)	Meter pr. Secund. (*Metres per Second.*)
0	1.3
1	3.6
2	5.8
3	8.0
4	10.3
5	12.5

Paa et Dampskib, der gjør omkring 10 Mils Fart ($v = 5$), vil det altsaa være heldigt at *observere* Vindretningen paa Søen, naar Vindstyrken er under 1—2 Beaufort Scala. Man faar den da paa 1 Stregs Nøjagtighed, og nøjere kan vanskelig svage Vindes Retning bestemmes. Disse Grænser svare til den Fejl, man kan erholde i Vinkelen u med en Vindmaaler, der maaler Vindhastigheden med en Nøjagtighed af 1^m pr. Sec. Paa Dampskibe, som gjøre en stor Fart, over 16 Kvartmil i Timen (8^m pr. Sec.), maa Retningen af Vinde indtil 3 Beaufort Scala observeres paa Søen.

Vi have endnu et Tilfælde, i hvilket det er nødvendigt at *observere* Vinkelen u. Det er, naar Vindens Hastighed ombord er mindre end Vindmaalerens Frictionscoefficient. I dette Tilfælde bevæger Vindmaaleren sig ikke, og Størrelsen w kan ikke maales. Til at bestemme W har man da alene Formelen

$$W = v \frac{\sin y}{\sin (u-y)}.$$

Efter denne Formel kan man finde den sande Vindhastighed uden Vindmaaler, alene ved Loggen og observerede Vindretninger. Formelen giver imidlertid i enkelte Tilfælder, som naar y og u er 0, ikke noget Resultat.

De følgende Betragtninger gjælde kun det Tilfælde, at den ombord følte Vindhastighed er mindre end Vindmaalerens Frictionscoefficient, et Tilfælde som indtræffer, naar Vinden kommer agtenfra og dens Hastighed er meget nær saa stor som Skibets Fart, eller naar baade Vindhastighed og Skibets Fart ere meget smaa. Kaldes Frictionscoefficienten f, er altsaa Betingelsen, at $w < f$.

Differentieres Ligningen for W, faar man:

With a steamer running 10 miles an hour ($v = 5$), it will therefore be best to *observe* the direction of the wind on the sea-surface when the force of the wind is less than 1—2 Beaufort Scale. The accuracy attainable can be within a point, and more accurately the direction of a faint breeze can hardly be determined. These limits correspond to the error that can vitiate the determination of the angle u with an anemometer that measures the velocity of the wind with an accuracy of 1 metre per second. With steamers of great speed, running upwards of 16 miles an hour (8 metres per second), the direction of the wind up to 3 Beaufort Scale must be observed direct from the sea-surface.

There is another case in which it is necessary to *observe* the angle u, viz. when the velocity of the wind as felt on board is less than the friction-coefficient of the anemometer. In that case the anemometer does not revolve, and the value of w cannot be measured. The only way of determining W is then by means of the formula —

$$W = v \frac{\sin y}{\sin (u-y)}.$$

By this formula the true velocity of the wind may be found without the anemometer, from the log alone and the observed directions of the wind. In some cases, however, as, for instance, when y and $u = 0$, this formula gives no result.

The following remarks apply only to the case in which the velocity of the wind as felt on board is less than the friction-coefficient of the anemometer, a case that occurs when the wind comes right aft and its velocity is very nearly as great as the speed of the vessel, or when the velocity of the wind and the speed of the vessel are both very low. Hence, if we call the friction-coefficient f, w is assumed to be $< f$.

By differentiating the equation for W, we get: —

$$dW = \frac{\sin y}{\sin (u-y)} dv + v \frac{\sin u}{\sin^2 (u-y)} dy - v . \sin y \frac{\cos (u-y)}{\sin^2 (u-y)} du.$$

$$1. \quad \frac{dW}{dv} = \frac{\sin y}{\sin (u-y)}.$$

Naar $u = 0$ eller 180^0, er $\frac{dW}{dv} = \frac{\sin y}{\pm \sin y} = \pm 1$.

Samtidig er $y = 0$. Fejlen i Loggen gaar over i Vindhastigheden. Er $u = 90^0$, hvilket kun kan finde Sted, naar $v < f$, bliver $\frac{dW}{dv} = \frac{\sin y}{\cos y} = \text{tang } y$. Den største Værdi af tang y bliver $\frac{\sqrt{f^2 - v^2}}{v} = \sqrt{\left(\frac{f}{v}\right)^2 - 1}$, en Størrelse, der nærmer sig $\frac{f}{v}$, naar v nærmer sig til 0. Den

When $u = 0$, or 180^0, $\frac{dW}{dv} = \frac{\sin y}{\pm \sin y} = \pm 1$.

In that case $y = 0$. The error in the log passes wholly into the velocity of the wind. If $u = 90^0$, which can occur only when $v < f$, $\frac{dW}{dv} = \frac{\sin y}{\cos y} = \tan y$. The greatest value of $\tan y$ will be $\frac{\sqrt{f^2 - v^2}}{v} = \sqrt{\left(\frac{f}{v}\right)^2 - 1}$ a magnitude that tends towards $\frac{f}{v}$ when v approximates 0.

bliver lig 1, naar $\frac{f}{v} = \sqrt{2}$. Naar Skibets Hastighed er mindre end $\frac{f}{\sqrt{2}}$, kan saaledes en Fejl i Loggen frembringe en Fejl i Vindhastigheden, der gaar fra denne Fejls Størrelse til uendelig. Med andre Ord, Vindhastigheden lader sig ikke bestemme ved Loggen.

Er $y = 90^0$, bliver $\frac{dW}{dv} = \frac{-1}{\cos u}$. Er v stor i Forhold til f, bliver u altid nær 180^0, og $\frac{dW}{dv}$ nær 1. Naar $v < f$, bliver den største Værdi af $\frac{1}{\cos u} = \frac{\sqrt{v^2 + f^2}}{v} = \sqrt{1 + \left(\frac{f}{v}\right)^2}$, en Størrelse, der fra $\sqrt{2}$ stiger i det Uendelige med aftagende v. Her gjælder saaledes det Samme, som i foranstaaende Tilfælde.

2. $\frac{dW}{dy} = v \frac{\sin u}{\sin^2 (u - y)}$.

Er $y = 0$, bliver $\frac{dW}{dy} = \frac{1}{\sin u}$; men paa samme Tid er u enten 0 eller 180^0, saaat Udtrykket bliver uendeligt, det er: Vindhastigheden lader sig ikke bestemme i dette Tilfælde. Formelen for W giver i dette Tilfælde $\frac{0}{0}$.

Er $u = 90^0$ $(v < f)$, bliver $\frac{dW}{dy} = v \frac{1}{\cos^2 y}$, eller naar dy regnes i Grader

$$dW = \frac{\pi}{180} \cdot \frac{v}{\cos^2 y} dy.$$

Den største Værdi af y haves, naar $\cos y = \frac{v}{f}$ og Værdien af dW kan saaledes stige til $\frac{\pi}{180} \cdot \frac{f^2}{v} dy$.

Ex. $f = 1.2$, $v = 1.0$, $dy = 5^0$ giver $dW = 0.13$. Naar v nærmer sig til 0, nærmer Maximumsværdien af dW sig uendelig.

Er $y = 90^0$, bliver $\frac{dW}{dy} = v \frac{\sin u}{\cos^2 u}$.

Dette Udtryk nærmer sig $v \sin u$, naar u er liden, det er, naar v er stor i Forhold til f.

Er $v < f$, kan, naar $y = 90^0$, u variere fra 180^0 til arc $\left(\sin = \frac{f}{\sqrt{f^2 + v^2}}\right)$, eller arc $\left(\cos = -\frac{v}{\sqrt{v^2 + f^2}}\right)$. I første Fald bliver $\frac{dW}{dy} = 0$, i sidste Fald bliver $\frac{dW}{dy} = \frac{f}{v} \sqrt{1 + \left(\frac{f}{v}\right)^2}$.

Er f. Ex. $f = 1.2$, $v = 1.0$, $dy = 5^0$, faaes $dW = 0.16$.

It is equal to 1 when $\frac{f}{v} = \sqrt{2}$. When the speed of the ship is less then $\frac{f}{\sqrt{2}}$, an error in the log can accordingly produce an error in the velocity of the wind ranging from the magnitude of that error to infinity. In other words, the velocity of the wind cannot be determined by means of the log.

If $y = 90^0$, $\frac{dW}{dv} = \frac{-1}{\cos u}$. If the value of v be considerable in proportion to that of f, u will always approximate 180^0, and $\frac{dW}{dv}$ approximate 1. When $v < f$, the greatest value of $\frac{1}{\cos u} = \frac{\sqrt{v^2 + f^2}}{v} = \sqrt{1 + \left(\frac{f}{v}\right)^2}$, a magnitude that from $\sqrt{2}$ increases towards infinity, with a diminishing value for v. Hence, the same remark applies here as in the foregoing case.

2. $\frac{dW}{dy} = v \frac{\sin u}{\sin^2 (u - y)}$.

If $y = 0$, $\frac{dW}{dy} = \frac{1}{\sin u}$; but u is then either 0 or 180^0, and hence the expression will be infinite, i. e. the velocity of the wind cannot be measured. The formula for W gives in such case $\frac{0}{0}$.

If $u = 90^0$, $(v < f)$ $\frac{dW}{dy} = v \frac{1}{\cos^2 y}$, or, computing with dy in degrees,

$$dW = \frac{\pi}{180} \cdot \frac{v}{\cos^2 y} dy.$$

The greasest value of y is reached when $\cos y = \frac{v}{f}$, and the value of dW can accordingly rise to $\frac{\pi}{180} \cdot \frac{f^2}{v} dy$.

Ex. $f = 1.2$, $v = 1.0$, $dy = 5^0$ gives $dW = 0.13$. When v approximates 0, the maximum value of dW increases towards infinity.

If $y = 90^0$, $\frac{dW}{dy} = v \frac{\sin u}{\cos^2 u}$.

This expression approximates $v \sin u$ when u is small, i. e. when the value of v is considerable in proportion to that of f.

If $v < f$, u can, when $y = 90^0$, vary from 180^0 to arc $\left(\sin = \frac{f}{\sqrt{f^2 + v^2}}\right)$, or arc $\left(\cos = -\frac{v}{\sqrt{v^2 + f^2}}\right)$. In the former case, $\frac{dW}{dy} = 0$; in the latter, $\frac{dW}{dy} = \frac{f}{v} \sqrt{1 + \left(\frac{f}{v}\right)^2}$.

If, for example, $f = 1.2$, $v = 1.0$, $dy = 5^0$, $dW = 0.16$.

Men naar v nærmer sig til 0, voxer dW mod uendelig.

3. $\frac{dW}{du} = v \sin y \frac{\cos (u-y)}{\sin^2 (u-y)}$.

Er $y = 0$, bliver $\frac{dW}{du}$ ganske ubestemt, da u samtidigt er 0.

Er $u = 90^0$, bliver $\frac{dW}{du} = v \tan^2 y$, hvis største Værdi er $(v < f)$ $v \frac{f^2-v^2}{v^2} = \frac{f^2-v^2}{v}$. Med $f = 1.2$, $v = 1.0$, $du = 11.^025$ faaes $dW = 0.28$. Med $v = 0$, bliver dette Udtryk ∞.

Er $y = 90^0$, bliver $\frac{dW}{du} = v \frac{\sin u}{\cos^2 u}$, et Udtryk, som er discutteret ovenfor under 2.

Man kommer saaledes oftere i Forlegenhed, naar Vindmaaleren ikke kan bevæge sig og maale Vindhastigheden ombord, enten fordi Skibet med Vinden agterind gjør næsten samme Fart som Vinden, eller fordi baade Farten og den virkelige Vindhastighed er saa liden, at man er reduceret til det samme Tilfælde som paa Land, med fast Vindmaaler og en saa liden Vindstyrke, at den ikke kan dreje Vindmaaleren. I første Tilfælde bliver den beregnede Vindhastighed usikker om et Beløb svarende til Vindmaalerens Frictionscoefficient eller $W = v \pm f$. I sidste Tilfælde bliver W liden og $W < f$.

Ombord i et Skib har man det i Regelen, navnlig paa et Dampskib under Damp, i sin Magt at faa Vindmaaleren til at dreje sig, enten ved at øge eller sagtne Farten eller ved at dreje til Vinden. I Praxis kan man imidlertid vanskelig gjøre Regning paa, at en Skibsfører vil udføre disse Manøvrer, alene for at bestemme Vindhastigheden med en Meters større Nøjagtighed.

But when v approximates 0, dW increases towards infinity.

3. $\frac{dW}{du} = v \sin y \frac{\cos (u-y)}{\sin^2 (u-y)}$.

If $y = 0$, the value of $\frac{dW}{du}$ is indeterminable, since u also $= 0$.

If $u = 90^0$, then $\frac{dW}{du} = v \tan^2 y$, the greatest value of which is $(v < f)$ $v \frac{f^2-v^2}{v^2} = \frac{f^2-v^2}{v}$. With $f = 1.2$, $v = 1.0$, $du = 11.^025$, we get $dW = 0.28$. With $v = 0$, this expression is ∞.

If $y = 90^0$, then $\frac{dW}{du} = v \frac{\sin u}{\cos^2 u}$, an expression discussed above (*vide* 2).

Hence, the observer is often perplexed when the anemometer does not move and measure the velocity of the wind on board, either because the speed of the vessel — the wind coming right aft — is almost the same as the velocity of the wind, or because the speed of the vessel and the velocity of the wind are both so low that the case is precisely the same as on shore with a fixed anemometer and the wind of such trifling force that the anemometer will not revolve. In the former case, the computed velocity of the wind has an error corresponding to the friction-coefficient of the anemometer, or $W = v \pm f$. In the latter case W will be small, and $W < f$.

On board a ship, more especially a vessel under steam, the anemometer may, as a rule, be made to revolve, either by increasing or diminishing the speed, or by hauling to the wind. In practice, however, the captain of a ship can hardly be expected to execute such manœuvres solely for the purpose of determining the velocity of the wind with a metre's greater accuracy.

Ved Benyttelsen af de her givne Formler til Bestemmelsen af den sandsynlige Fejl af de Vindhastigheder og Vindretninger, der ere beregnede efter de paa Nordhavs-Expeditionen gjorte Vind-Iagttagelser, gaar jeg ud fra følgende Forudsætninger.

Den sandsynlige Fejl (dw) af en med Vindmaaleren maalt Vindhastighed sætter jeg for 1876 til $\pm 1.^m0$ pr. Sec., heri indesluttet den tidligere nævnte Correction, der følger af, at der er regnet med Forholdet mellem Vindhastighed og Skaalcenterhastighed som 3:1. For 1877 og 1878 regner jeg $dw = \pm 0.^m5$ pr. Secund, idet jeg her, ligesom for 1876, tager Hensyn til, at Vindens Hastighed i Løbet af de 30 Secunders Registreringstid neppe nogensinde er aldeles jevn.

When applying the formulæ given above to determine the probable error in the velocity and direction of the wind computed from the wind-observations taken on the North-Atlantic Expedition, I start with the following suppositions: —

The probable error (dw) of a wind-velocity measured with the anemometer, I put for 1876 at $\pm 1.^m0$ per second, including the above-mentioned correction, which results from taking the ratio between the velocity of the wind and that of the cup centres at 3 : 1. For 1877 and 1878, I put $dw = \pm 0.^m5$ per second, having, as in 1876, regard to the velocity of the wind during the interval of registration, 30 seconds, being rarely, if ever, quite uniform.

Den sandsynlige Fejl i Bestemmelsen af Skibets Hastighed sætter jeg, efter de ovenfor givne Bemerkninger herom, for 1876 $dv = \pm 0.^m5$ pr. Secund. For 1877 og 1878 derimod, da Vandloggen kunde observeres med en Nøjagtighed af $\pm$ 0.2 Knob, eller $0.^m1$ pr. Secund, sætter jeg $dv = \pm 0.^m2$ pr. Secund, idet der bør tages Hensyn til, at Strøm giver Fartøjet en anden Fart gjennem Luften, end det har gjennem Vandet, og at de smaa Hastigheder ikke kunne maales med den Nøjagtighed som de større. Hertil kommer ogsaa Usikkerheden ved Vandloggens Nulpunkt, der altid vil være tilstede, ihvorvel dette Punkt stadig blev verificeret under de hyppige Standsninger, der gjordes ved Lodning og Skrabning.

Den sandsynlige Fejl (dy) af en over Compasset observeret Vindretning sætter jeg, som ovenfor allerede nævnt, til $\pm 5^0$ eller $^1/_2$ Streg. Den kan antages at være den samme i alle 3 Expeditions-Aar.

Disse 3 Fejl ere i Regelen samtidigt indvirkende paa den beregnede Vindhastighed og den beregnede Vindretning. Sættes i Ligningerne (11) og (12), efter hvilke denne Indflydelse kan beregnes,

The probable error in the determination of the speed of the ship, I put, in accordance with the statement detailed above, for 1876, at $dv = \pm 0.^m5$ per second. For 1877 and 1878, on the other hand, since the water-log could be observed with an accuracy of $\pm$ 0.2 knots, or $0.^m1$ per second, I put $dv = \pm 0.^m2$ per second, due regard being had to the fact, that a current gives the vessel a different rate through the air than she has through the water, and also that low velocities cannot be measured with the same accuracy as high. Moreover, the uncertainty attaching to the zero point of the water-log, which will always exist, though the said point was constantly verified during the frequent stoppages necessary for sounding and dredging, has to be taken into account.

The probable error (dy) in the direction of the wind as observed by the compass, I put, as stated above, at $\pm 5^0$, or half a point. It may be assumed to have been the same on each of the three cruises of the Expedition.

The effect of these 3 errors will as a rule enter simultaneously into the computed velocity and the computed direction of the wind. Now, substituting in the equations (11) and (12), by which this influence can be computed,

$$w \sin y = W \sin u \qquad (14)$$
$$w \cos y = W \cos u + v \qquad (15)$$

saa faar man følgende Formler, der tildels kunne være lettere at regne med.

we get the following formulæ, which in some cases may be easier to compute with.

$$d\,W = \frac{W + v\cos u}{w}\,dw - \cos u\,dv + v \sin u\,dy \qquad (16)$$
$$du = -\frac{v \sin u}{wW}\,dw + \frac{\sin u}{W}\,dv + \left(1 + \frac{v}{W}\cos u\right)dy \qquad (17)$$

Regner man, saaledes som i det Følgende er gjort, med en constant W og v, saa beregnes w og y af (14) og (15).

Sættes

If, as I have done in the following computations, we take a constant value for W and v, w and y are found from (14) and (15).

Putting

$$\cos(u - y) = \cos e = \frac{W + v\cos u}{w} = a$$
$$\cos u = b$$
$$w \sin(u - y)\frac{\pi}{180} = w \sin e \frac{\pi}{180} = v \sin u \frac{\pi}{180} = c$$
$$-\frac{\sin(u - y)}{W}\frac{180}{\pi} = -\frac{\sin e}{W}\frac{180}{\pi} = -\frac{v \sin u}{wW}\frac{180}{\pi} = a'$$
$$\frac{\sin u}{W}\frac{180}{\pi} = b'$$
$$\frac{w}{W}\cos(u - y) = \frac{w}{W}\cos e = 1 + \frac{v}{W}\cos u = c'$$

saa har man i de enkelte Tilfælder den sandsynlige Fejl af W og u:

the probable error of W and u in the several cases will be

$$dW = \pm \sqrt{(a\,dw)^2 + (b\,dv)^2 + (c\,dy)^2} \qquad (18)$$

$$du = \pm \sqrt{(a'\,dw)^2 + (b'\,dv)^2 + (c'\,dy)^2} \qquad (19)$$

For at finde den gjennemsnitlige Værdi af dW og du har jeg gaaet frem paa følgende Maade:

Ifølge den meteorologiske Dagbog var i 1876 Middelværdien af $W = 9.^{m}85$ pr. Secund og af $v = 1.^{m}92$ pr. Secund. Heri ere indbefattede alle de Tilfælder, i hvilke W eller v vare lig 0. Af 744 Tilfælder vare 308 med $v = 0$.

I 1877 var Middelværdien af $W = 6.9$, af $v = 1.95$
I 1878 „ „ „ $W = 8.0$, „ $v = 1.82$

I Middel af begge $W = 7.45$ $v = 1.885$

I 1877 var $v = 0$ i 352 Tilfælder af 965
I 1878 „ $v = 0$ i 394 „ „ 1187

Sættes med runde Tal
for 1876: $W = 10^{m}$ pr. Sec. $v = 2^{m}$ pr. Sec.
for 1877 og 1878: $W = 7.^{m}5$ pr. Sec. $v = 2^{m}$ pr. Sec.
saa giver Beregningen efter (18) og (19) følgende Resultat.

To find the average value of dW and du, I have proceeded as follows: —

According to the entries in the Meteorological Journal for 1876, the mean value of $W = 9.^{m}85$ per second, and that of $v = 1.^{m}92$ per second. These values include all cases in which W or v was equal to 0. Of 744 observations, v was equal to 0 in 308.

In 1877 the mean value of $W = 6.9$; of v 1.95
In 1878 „ „ „ „ $W = 8.0$; „ v 1.82

The mean of both was accordingly $W = 7.45$; of v 1.885

In 1877 v was equal to 0 in 352 cases of 965
In 1878 „ „ „ „ „ „ 394 „ „ 1187

Putting, in round numbers,
for 1876, $W = 10^{m}$ per second; $v = 2^{m}$ per second,
for 1877 and 1878, $W = 7.^{m}5$ per second; $v = 2^{m}$ per second, the computation, according to (18) and (19) gives the following result: —

1876.

$W = 10^{m}$, $v = 2^{m}$, $dw = 1^{m}$, $dv = 0.^{m}5$, $dy = 5^{0}$.

	$u = 0^{0}$	$u = 30^{0}$	$u = 60^{0}$	$u = 90^{0}$	$u = 120^{0}$	$u = 150^{0}$	$u = 180^{0}$
$w =$	$12.^{m}0$	$11.^{m}8$	$11.^{m}1$	$10.^{m}2$	$9.^{m}2$	$8.^{m}3$	$8.^{m}0$
$y =$	0^{0}	25^{0}	51^{0}	79^{0}	109^{0}	143^{0}	180^{0}
$e =$	0^{0}	5^{0}	9^{0}	11^{0}	11^{0}	7^{0}	0^{0}
$adw =$	1.00	1.00	0.99	0.98	0.98	0.99	1.00
$bdv =$	0.50	0.43	0.25	0.00	0.25	0.43	0.50
$cdy =$	0.00	0.09	0.15	0.17	0.15	0.09	0.00
$dW =$	1.12	1.09	1.03	1.00	1.02	1.08	1.12
$a'dw =$	$0.^{0}0$	$0.^{0}5$	$0.^{0}9$	$1.^{0}1$	$1.^{0}1$	$0.^{0}7$	$0.^{0}0$
$b'dv =$	$0.^{0}0$	$1.^{0}4$	$2.^{0}5$	$2.^{0}9$	$2.^{0}5$	$1.^{0}4$	$0.^{0}0$
$c'dy =$	$6.^{0}0$	$5.^{0}9$	$5.^{0}5$	$5.^{0}0$	$4.^{0}5$	$4.^{0}1$	$4.^{0}0$
$du =$	$6.^{0}0$	$6.^{0}1$	$6.^{0}1$	$5.^{0}9$	$5.^{0}3$	$4.^{0}4$	$4.^{0}0$

1877 og (*and*) **1878.**

$W = 7.^{m}5$, $v = 2^{m}$, $dw = 0.^{m}5$, $dv = 0.^{m}2$, $dy = 5^{0}$.

	$u = 0^{0}$	$u = 30^{0}$	$u = 60^{0}$	$u = 90^{0}$	$u = 120^{0}$	$u = 150^{0}$	$u = 180^{0}$
$w =$	$9.^{m}5$	$9.^{m}3$	$8.^{m}8$	$7.^{m}8$	$6.^{m}8$	$5.^{m}9$	$5.^{m}5$
$y =$	0^{0}	24^{0}	49^{0}	75^{0}	105^{0}	140^{0}	180^{0}
$e =$	0^{0}	6^{0}	11^{0}	15^{0}	15^{0}	10^{0}	0^{0}
$adw =$	0.50	0.50	0.49	0.48	0.48	0.49	0.50
$bdv =$	0.20	0.17	0.10	0.00	0.10	0.17	0.20
$cdy =$	0.00	0.09	0.15	0.17	0.15	0.09	0.00
$dW =$	0.54	0.53	0.52	0.51	0.51	0.53	0.54
$a'dw =$	$0.^{0}0$	$0.^{0}4$	$0.^{0}8$	$1.^{0}0$	$1.^{0}0$	$0.^{0}7$	$0.^{0}0$
$b'dv =$	$0.^{0}0$	$0.^{0}8$	$1.^{0}3$	$1.^{0}5$	$1.^{0}3$	$0.^{0}8$	$0.^{0}0$
$c'dy =$	$6.^{0}3$	$6.^{0}2$	$5.^{0}7$	$5.^{0}0$	$4.^{0}3$	$3.^{0}7$	$3.^{0}7$
$du =$	$6.^{0}3$	$6.^{0}2$	$5.^{0}9$	$5.^{0}3$	$4.^{0}6$	$3.^{0}9$	$3.^{0}7$

Af disse Tabeller ser man, at Værdierne af de sandsynlige Fejl af de beregnede Vindhastigheder og Vindretninger praktisk talt ikke ere væsentlig forskjellige fra Værdierne af de sandsynlige Fejl af de ombord observerede

From these Tables, it appears that, practically, the values of the probable error of the computed velocity and the computed direction of the wind, are nearly the same as the values of the probable error of the velocity and direction as observed on

Hastigheder og Retninger. Under forskjellige Kurser (forskjellige Værdier af u) variere dW og du kun lidet. Gives Værdierne for $u = 0^0$ og $u = 180^0$ halv Vægt og tages Medium af Horizontalrækkerne for dW og for du, saa faar man følgende Værdier:

1876. $dW = \pm 1.^m06$ $du = \pm 5.^045$.
1877 og 1878. $dW = \pm 0.^m52$ $du = \pm 5.^014$.

Tager man Medium af Værdierne for $u = 0^0$, $u = 90^0$ (dobbelt Vægt) og $u = 180^0$, saa kommer man til de samme Værdier for dW, nemlig respective 1.06 og 0.52, og paa det allernærmeste de samme Værdier for du, nemlig respective $5.^044$ og $5.^016$.

I Gjennemsnit falde saaledes de sandsynlige Fejl af de beregnede Værdier ganske lidt større end af de observerede.

For at vise, hvorledes de sandsynlige Fejl falde under forskjellige i Virkeligheden forekommende Tilfælder, har jeg beregnet de følgende Tabeller. En Fart af over 4 Meter pr. Secund eller 8 Kvartmil i Timen opnaaedes kun sjelden paa vor Expedition. Ligeledes er det sjelden, at Vindhastigheder over 20 Meter pr. Secund forekomme. Vindhastigheder paa mindre end 5^m pr. Secund forekomme, naar Fartøjet har været under Gang,

i 1876 82 Gange paa 744 Observationer 1:9
i 1877 129 „ „ 965 „ 1:8
i 1878 176 „ „ 1178 „ 1:7

I disse sidste Tilfælder er Vindens Retning mindre nøjagtigt bestemt og Usikkerheden i omvendt Forhold til Vindhastigheden, ligesom paa Land, hvor de svage Vindes Retning i Regelen er mere ubestemt end de sterkeres. De Vinde, her er Tale om, have en Vindstyrke efter Beaufort Scale mindre end 2.

board. On different courses (different values of u) dW and du are much the same. Giving half weight to the values corresponding to $u = 0^0$ and $u = 180^0$, and taking the mean of the horizontal series for dW and du, we get the following values: —

1876, $dW = \pm 1.^m06$; $du = \pm 5.^045$.
1877 and 1878, $dW = \pm 0.^m52$; $du = \pm 5.^014$.

If we take the mean of the values for $u = 0^0$, $u = 90^0$ (double weight) and $u = 180^0$, we get precisely the same values for dW, viz. 1.06 and 0.52; and very nearly the same values for du, viz. $5.^044$ and $5.^016$.

Hence, the probable error of the computed values is found to be a trifle in excess of that of the observed.

To show the amount of the probable error as found in different cases that actually occur, I have worked out the following Tables. A speed of more than 4 metres per second, or 8 miles an hour, was seldom reached on the Norwegian Expediton. The velocity of the wind, too, rarely exceeded 20 metres per second. A wind-velocity of less than 5 metres per second occurs when the vessel has been under way.

In 1876, 82 times in 744 observations 1:9.
In 1877, 129 „ „ 965 „ 1:8.
In 1878, 176 „ „ 1178 „ 1:7.

In these last cases the direction of the wind is less accurately determined, and the uncertainty of the result bears an inverse proportion to the velocity of the wind; as on shore, where, as a rule, the direction of a faint breeze is more difficult to determine than that of a stronger wind. Measured by the Beaufort Scale, the winds of which there is question here have a force of less than 2.

1876.

W^m	u^0	dW			du		
		$v = 0$	$v = 2$	$v = 4$	$v = 0$	$v = 2$	$v = 4$
5	0	$1.^m12$	$1.^m12$	$1.^m12$	$5.^00$	$7.^00$	$9.^00$
	90	1.00	0.62	0.85	7.6	8.7	10.7
	180	1.12	1.12	1.12	5.0	3.0	1.0
10	0	1.12	1.12	1.12	5.0	6.0	7.0
	90	1.00	1.00	0.99	5.8	5.9	6.1
	180	1.12	1.12	1.12	5.0	4.0	3.0
15	0	1.12	1.12	1.12	5.0	5.7	6.3
	90	1.00	1.01	1.03	5.4	5.4	5.4
	180	1.12	1.12	1.12	5.0	4.3	3.7
20	0	1.12	1.12	1.12	5.0	5.5	6.0
	90	1.00	1.01	1.04	5.2	5.2	5.2
	180	1.12	1.12	1.12	5.0	4.5	4.0

1877 og (*and*) 1878.

W^m	u^0	dW			du		
		$v = 0$	$v = 2$	$v = 4$	$v = 0$	$v = 2$	$v = 4$
5	0	$0.^m54$	$0.^m54$	$0.^m54$	$5.^00$	$7.^00$	9.0
	90	0.50	0.49	0.52	5.5	5.9	6.6
	180	0.54	0.54	0.54	5.0	3.0	1.0
10	0	0.54	0.54	0.54	5.0	6.0	7.0
	90	0.50	0.53	0.58	5.1	5.2	5.2
	180	0.54	0.54	0.54	5.0	4.0	3.0
15	0	0.54	0.54	0.54	5.0	5.7	6.3
	90	0.50	0.53	0.60	5.1	5.1	5.1
	180	0.54	0.54	0.54	5.0	4.3	3.7
20	0	0.54	0.54	0.54	5.0	5.5	6.0
	90	0.50	0.53	0.60	5.0	5.0	5.0
	180	0.54	0.54	0.54	5.0	4.5	4.0

Man ser, at Vinde, hvis Styrke er over 2 Beaufort Scale, ere angivne med Hensyn til Hastighed altid meget nær lige saa nøjagtigt, som denne er maalt ombord, og med Hensyn til Retning mindst paa 1 Stregs Nøjagtighed. I Overensstemmelse hermed er i Tabellerne over de meteorologiske Observationer Vindens Retning angiven paa nærmeste Streg og Vindens Hastighed i 1876 paa hel Meter, i 1877 og 1878 paa Tiendedel Meter pr. Secund.

From the above Tables, it appears that a wind with a force of more than 2 Beaufort Scale, is, as regards velocity, always given with very nearly the same accuracy as measured on board, and, as regards direction, with an accuracy of at least 1 point. According to the above, in the meteorological observations set forth in the Tables the direction of the wind has been given to the nearest point, and the velocity of the wind, for 1876, to the nearest whole metre, for 1877 and 1878 to the nearest tenth of a metre per second.

Beregningen af Vindobservationerne udførtes paa følgende Maade:

Skibets Fart, udtrykt i Kvartmil i Timen, omgjordes til Meter pr. Secund efter følgende Tabel:

The computation of the wind-observations was effected as follows: —

The speed of the vessel, expressed in miles an hour, was converted into metres per second, according to the following Table: —

1 Kvartmil i Timen = 0.5153 Meter pr. Secund. (*1 Mile an Hour = 0.5153 Metre per Second*).

Kvartmil i Timen.	Meter pr. Secund. (*Metres per Second*).										Miles an Hour.
	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	
0	0.0	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0
1	0.5	0.6	0.6	0.7	0.7	0.8	0.8	0.9	0.9	1.0	1
2	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.4	1.5	2
3	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9	1.9	2.0	3
4	2.1	2.2	2.2	2.3	2.3	2.4	2.4	2.5	2.5	2.6	4
5	2.6	2.7	2.7	2.8	2.8	2.9	2.9	3.0	3.0	3.1	5
6	3.1	3.2	3.2	3.3	3.3	3.4	3.4	3.5	3.5	3.6	6
7	3.6	3.7	3.7	3.8	3.8	3.9	3.9	4.0	4.0	4.1	7
8	4.1	4.2	4.2	4.3	4.3	4.4	4.4	4.5	4.5	4.6	8
9	4.6	4.7	4.7	4.8	4.8	4.9	4.9	5.0	5.0	5.1	9
10	5.2	5.2	5.3	5.4	5.4	5.5	5.5	5.6	5.6	5.7	10
11	5.7	5.8	5.8	5.9	5.9	6.0	6.0	6.1	6.1	6.2	11
12	6.2	6.3	6.3	6.4	6.4	6.5	6.5	6.6	6.6	6.6	12

Vindmaalerens Registrering omgjordes, i 1876, til Vindhastighed i Meter pr. Secund. 1 Delstreg regnedes, som ovenfor forklaret, lig $\frac{29}{30}$ Meter pr. Secund. I 1877 og 1878 havde man kun at addere Frictionscoefficienten til den registrerede Vindhastighed.

Af den paa nærmeste hele Grad noterede Kurs paa Compasset beregnedes efter Capt. Willes Deviationstabeller den rigtige misvisende Kurs. Med den for den anlagte

The registration of the anemometer was converted, for 1876, into metres per second. One division of the scale was taken, as stated above, equal to $\frac{29}{30}$ metre per second. In 1877 and 1878, the friction-coefficient had only to be added to the registered velocity of the wind.

Taking the course per compass within the nearest whole degree, the true magnetic course was found from Captain Wille's Deviation Tables. With the value of the

Jeg har foretrukket den først beskrevne Methode for at kunne holde Deviation og Misvisning ud fra hinanden.

Beregningerne udførtes efter nedenstaaende Skema og Exempel.

described above, in order to keep apart the deviation and the variation.

The computations were made as shown below.

1877. Juni 16. Klokkeslet.	5 am.	6 am.	7 am.	8 am.	9 am.	MD.	3 pm.	Hour. 1877. June 16.
Observeret Kurs	N 35° E	S 45° W	S 45° W	S 58° W	S 28° W	S 78° W	S 45° E	Ship's Head by C.
Misvisende Kurs	N 22° E	S 66° W	S 66° W	S 80° W	S 45° W	N 81° W	S 59° E	Do. true Magnetic Course.
Log. Meter pr. Sec.	3.8	0.	0.3	0.	2.2	0.	4.4	Log. Metres per Second.
Observ. Vind-Retn. p. C.	S 85° W	S 25° W	S 30° W	S 26° W	S 28° W	S 33° W	S 33° W	Observed Direction of Wind by C.
Deviation	− 13°	+ 21°	+ 21°	+ 22°	+ 16°	+ 21°	— 14°	Deviation.
Misv. Vindretning ombord	S 72° W	S 46° W	S 51° W	S 48° W	S 44° W	S 54° W	S 21° W	Obs. true Magnetic Dir. of Wind.
Obs. Vindhastig. Meter pr. Sec.	4.9	5.6	7.9	8.4	11.4	12.0	9.8	Observed Velocity of Wind.
Construeret misv. Vindretn.	S 50° W	S 46° W	S 50° W	S 48° W	S 44° W	S 54° W	S 47° W	Constructed Magn. Direction of Wind.
Misvisning	— 19°	— 19°	— 19°	— 19°	— 19°	— 19°	— 19°	Variation of Compass.
Retvisende Vindretn. i Grader	S 31° W	S 27° W	S 31° W	S 29° W	S 25° W	S 35° W	S 28° W	True Direction of Wind.
„ „ Streger	SW*b*S	SSW	SW*b*S	SW*b*S	SSW	SW*b*S	SW*b*S	Do. in Points.
Sand Vindhastighed. Meter pr. Sec.	7.9	5.6	7.6	8.4	9.2	12.0	10.0	True Velocity of Wind. Metres per Second.

Man ser af dette Exempel, hvorledes man kommer tilbage til den samme Vindretning, uanseet de Variationer, som optræde i de observerede Værdier af Skibets og Vindens Hastighed og Retning.

Den i Grader opførte Vindretning omgjordes til Streger efter følgende Tabel.

From the above, it appears that the same result is obtained for the direction of the wind, notwithstanding the variation that occurs in the observed values for the speed and direction of the vessel and the velocity and direction of the wind.

The direction of the wind, expressed in degrees, was converted into points, according to the following Table.

N 6° W — N 6° E = N	N 84° E — S 84° E = E	S 6° E — S 6° W = S	S 84° W — N 84° W = W
N 6 E — N 17 E = N*b*E	S 84 E — S 73 E = E*b*S	S 6 W — S 17 W = S*b*W	N 84 W — N 73 W = W*b*N
N 17 E — N 28 E = NNE	S 73 E — S 62 E = ESE	S 17 W — S 28 W = SSW	N 73 W — N 62 W = WNW
N 28 E — N 39 E = NE*b*N	S 62 E — S 51 E = SE*b*E	S 28 W — S 39 W = SW*b*S	N 62 W — N 51 W = NW*b*W
N 39 E — N 51 E = NE	S 51 E — S 39 E = SE	S 39 W — S 51 W = SW	N 51 W — N 39 W = NW
N 51 E — N 62 E = NE*b*E	S 39 E — S 28 E = SE*b*S	S 51 W — S 62 W = SW*b*W	N 39 W — N 28 W = NW*b*N
N 62 E — N 73 E = ENE	S 28 E — S 17 E = SSE	S 62 W — S 73 W = WSW	N 28 W — N 17 W = NNW
N 73 E — N 84 E = E*b*N	S 17 E — S 6 E = S*b*E	S 73 W — S 84 W = W*b*S	N 17 W — N 6 W = N*b*W

Vindens Styrke forsøgtes noteret efter Beaufort Scale. Det viste sig imidlertid, at Iagttagerne, uden Vejledning som de i Regelen vare af Sejlføring paa Skibet, ikke formaaede at notere endog nogenlunde rigtig. Denne Observation opgaves derfor, og er ikke medtaget i Observationstabellerne.

The *force* of the wind was noted, so far as possible, by the Beaufort Scale. Meanwhile, it was found that the observers, without assistance as they were from the spread of canvas carried by the vessel, could not note the force with even comparative accuracy. Such observations, therefore, were relinquished, and will not be found in the Tables.

Søbarometret alle 3 Expeditionsaar. Naar Fartøjet havde inde hele sin Kul- og Vandbeholdning, var Barometrets Kapsel 1^{m} over Hav-Niveauet. Eftersom disse Beholdninger forbrugtes, løftede Fartøjet sig indtil 0.^{m}5 i Vandet. Barometerkapselens Højde over Havfladen var saaledes gjennemsnitlig 1.^{m}25, og Barometerhøjdens Reduction til Havfladen, der i Observationstabellerne er anbragt ved samme, er sat til + 0.^{mm}13.

I 1876 havde Expeditionen paa Rejsen til og fra Island stadig meget uroligt Vejr. Barometret var under disse Omstændigheder vanskeligt at observere, da det, navnlig naar Fartøjet satte, pumpede betydeligt. For at faa en brugbar Observation, maatte Iagttageren passe paa at opsøge den højeste og laveste Stand under Pumpningen og tage Middel af disse. Denne Observationsmethode tog imidlertid uforholdsmæssig lang Tid. At Observationerne dog have lykkets, derpaa tyder den regelmæssige Curve for den daglige Variation, som udkommer for 1876 og navnlig dennes Lighed med Curverne fra de to følgende Aar.

Efter Expeditionens Tilbagekomst til Bergen i 1876 sammenlignede jeg Søbarometret Adie 1493 med 2 Barometre, hvis Correctioner vare bestemte ved det meteorologiske Institut i Christiania. For det ene, Rejsebarometret Negretti & Zambra No. 649, fandtes i Maj 1876 Correctionen = + 0.^{mm}18, September 21—30 Correctionen = + 0.^{mm}12, Middel Corr. = + 0.^{mm}15. For det andet, Stationsbarometer Adie No. 1511, fandtes i Marts 1876 Correctionen = — 0.^{mm}34. Tages Medium af disse 2 Barometre, corrigerede med disse Correctioner, som Normal, give Sammenligningerne i Bergen, der udførtes paa Observatoriet, følgende Resultat.

(Fig. 4, *x*) the marine barometer retained on each of the three cruises of the Expedition. When the vessel had taken in her full complement of coal and water, the cistern of the barometer reached 1^{m} above the sea-level. As the said complement diminished, the vessel gradually rose 0.^{m}5 in the water. The height of the cistern of the barometer above the sea-level was accordingly on an average 1.^{m}25, and the reduction of the observations of the barometer to the sea-surface is put at + 0.^{mm}13. The observations given in the Tables include this correction.

In 1876, the Expedition encountered exceedingly boisterous weather on the whole of the passage to and from Iceland. Hence the barometer under these circumstances was difficult to observe, since, in particular when the vessel pitched, it pumped considerably. In order to obtain a trustworthy observation, the highest and lowest extremes reached during the pumping had to be noted as carefully as possible, and the mean of the two taken. This mode of observation was, however, necessarily troublesome and protracted. That the observations notwithstanding proved successful, may be inferred from the regularity of the curve resulting for the diurnal variation for 1876, and more especially from its conformity with the curves constructed for the two following years.

After the return of the Expedition to Bergen in 1876, I compared the marine barometer Adie No. 1493 with two barometers for which the corrections had been determined at the Meteorological Institute in Christiania. For one of these instruments, a mountain barometer, Negretti & Zambra No. 649, the correction in May 1876 was found = + 0.^{mm}18, in September (21—30) = + 0.^{mm}12; the mean correction being = + 0.^{mm}15. For the other instrument, a station barometer, Adie No. 1511, the correction in March 1876 was found = — 0.^{mm}34. Taking the mean of these two barometers, reduced with the said corrections, the comparisons in Bergen, made at the Observatory, gave the following result: —

1876.	Lufttryk (*Pressure*).	Corr. for Adie 1493.	
Sept. 4	755.4^{mm}	— 0.45^{mm}	
„ 5	740.3	— 0.60	Bar. sterkt faldende (*Bar. falling rapidly*).
„ 7	742.6	— 0.45	
„ 8	744.4	— 0.31	
Middel (*Mean*)	745.7	— 0.44	(MF = ± 0.08^{mm}.)

I Middelet er Observationen den 5te September givet halv Vægt.

Søbarometrets Correction har saaledes holdt sig constant fra Rejsens Begyndelse til dens Ende i 1876. Sammenligningerne i September vise ikke synderlig sterke Tegn til, at Correctionen skulde være mindre ved 740^{mm} end ved 755^{mm}. Barometerhøjder under 750^{mm} forekomme ikke hyppigt i 1876.

For the mean, the observation taken on the 5th of September has been given half weight.

The correction of the marine barometer had accordingly kept unchanged from the commencement of the cruise in 1876 to its termination. The comparisons undertaken in September do not afford particularly forcible indications that the correction for 740^{mm} should be less than for 755^{mm}. Readings of the barometer under 750^{mm} did not occur frequently in 1876.

med Sikkerhed, begge Barometre, det ene umiddelbart efter det andet. Paa denne Maade erholdt jeg 49 Sammenligninger, der kunde benyttes til at beregne en Formel for Aneroidbarometrets Correction til sand Barometerhøjde.

with accuracy both instruments in immediate succession. In this manner I succceded in obtaining 49 comparisons, which could be applied for computing a formula for the correction of the Aneroid barometer to true barometric pressure.

Er: N den sande Barometerhøjde ved Havfladen.
A Aflæsningen af Viseren paa Aneroidbarometret.
T „ „ Thermometret paa do.
t Antallet af Dage, forløbne fra 15de Juni.
a, b, c og d Constanter,
saa sætter jeg

$$N = A + a + b\,T + c\,(760 - A) + d\,t$$

og bestemmer de sandsynligste Værdier af Coefficienterne a, b, c og d efter de 49 Ligninger, som Sammenligningerne give, ved de mindste Kvadraters Methode.

N er saaledes Aflæsningen af Søbarometer Adie No. 1493, reduceret til 0°, og formindsket med 0.mm5.

Den følgende Tabel indeholder Resultaterne af de 49 Sammenligninger, samt de efter den fundne Formel beregnede Værdier af $N - A$, og Forskjellen mellem den observerede og beregnede Værdi af denne Størrelse.

If N be the true barometric pressure at the sea-level,
A the reading of the hand of the Aneroid barometer,
T „ „ „ the thermometer of the Aneroid,
t the number of days from the 15th of June,
a, b, c, and d constants,
I put

$$N = A + a + b\,T + c\,(760 - A) + d\,t,$$

and determine the most probable values of the coefficients a, b, c, and d from the 49 equations given by the comparisons, by the method of the least squares.

N is thus the reading of the marine barometer Adie No. 1493, reduced to 0° and diminished with 0.mm5.

The following Table contains the results of the 49 comparisons, as also the values of $N - A$ computed from the aforesaid formula, together with the difference between the observed and the computed value of that magnitude.

Datum. (*Date.*)	*N*	*T*	*A*	*N — A* obs.	*N — A* ber. (*comp.*)	Obs. — Ber. (*Obs. — Comp.*)	*t*
Juni 15	769.6mm	11.°8	770.3mm	— 0.7mm	— 1.5mm	+ 0.8mm	0
(*June*) 16	66.1	11.5	67.1	— 1.0	— 1.3	+ 0.3	1
"	65.7	10.6	67.2	— 1.5	— 1.2	— 0.3	1
17	64.3	11.9	65.7	— 1.4	— 1.2	— 0.2	2
19	67.1	10.1	68.1	— 1.0	— 1.2	+ 0.2	4
"	66.8	10.9	68.0	— 1.2	— 1.3	+ 0.1	4
21	61.2	7.5	61.9	— 0.7	— 0.5	— 0.2	6
"	59.8	12.7	60.5	— 0.7	— 1.0	+ 0.3	6
"	58.7	10.4	59.4	— 0.7	— 0.7	0.0	6
22	54.7	11.6	55.3	— 0.6	— 0.5	— 0.1	7
22	48.7	10.2	48.4	+ 0.3	+ 0.1	+ 0.2	7
23	46.0	14.4	46.2	— 0.2	— 0.2	0.0	8
24	47.9	11.0	47.3	+ 0.6	+ 0.1	+ 0.5	9
25	53.4	13.6	53.9	— 0.5	— 0.6	+ 0.1	10
27	48.9	13.0	49.3	— 0.4	— 0.3	— 0.1	12
28	55.3	10.9	55.7	— 0.4	— 0.5	+ 0.1	13
30	55.4	9.9	55.8	— 0.4	— 0.4	0.0	15
"	55.7	13.5	56.2	— 0.5	— 0.7	+ 0.2	15
Juli 1	55.0	12.0	55.5	— 0.5	— 0.5	0.0	16
3	56.8	20.8	58.6	— 1.8	— 1.7	— 0.1	18
4	58.3	11.5	59.2	— 0.9	— 0.7	— 0.2	19
5	58.9	11.1	60.1	— 1.2	— 0.7	— 0.5	20
6	57.7	12.0	58.3	— 0.6	— 0.7	+ 0.1	21
9	54.0	9.0	53.7	+ 0.3	0.0	+ 0.3	24
13	51.2	16.0	52.0	— 0.8	— 0.7	— 0.1	28
17	63.8	7.9	64.4	— 0.6	— 0.5	— 0.1	32
20	58.7	16.4	59.9	— 1.2	— 1.2	0.0	35
23	56.2	17.3	57.3	— 1.1	— 1.2	+ 0.1	38
24	55.7	17.0	57.1	— 1.4	— 1.1	— 0.3	39
27	57.0	11.5	57.9	— 0.9	— 0.6	— 0.3	42
28	56.6	7.4	56.7	— 0.1	0.0	— 0.1	43
30	58.0	5.0	57.7	+ 0.3	+ 0.1	+ 0.2	45
31	55.5	3.9	55.2	+ 0.3	+ 0.5	— 0.2	46
"	55.3	3.5	54.6	+ 0.7	+ 0.6	+ 0.1	47
Aug. 1	55.7	6.0	55.5	+ 0.2	+ 0.2	0.0	47
2	57.5	6.5	57.4	+ 0.1	0.0	+ 0.1	48
3	61.2	7.1	61.5	— 0.3	— 0.3	0.0	49
4	59.8	3.9	59.6	+ 0.2	+ 0.2	0.0	50
5	58.7	5.9	58.8	— 0.1	0.0	— 0.1	51
6	59.0	8.9	59.2	— 0.2	— 0.3	+ 0.1	52
7	60.0	9.9	60.5	— 0.5	— 0.4	— 0.1	53
8	59.0	11.9	60.3	— 1.3	— 0.7	— 0.6	54
9	58.2	15.8	59.0	— 0.8	— 1.0	+ 0.2	55
10	62.8	16.2	64.5	— 1.7	— 1.4	— 0.3	56
11	65.7	21.5	68.0	— 2.3	— 2.3	0.0	57
"	66.7	25.7	69.6	— 2.9	— 2.8	— 0.1	57
12	68.5	22.9	71.1	— 2.6	— 2.6	0.0	58
13	71.2	17.5	73.2	— 2.0	— 2.2	+ 0.2	59
16	61.3	10.0	61.9	— 0.6	— 0.6	0.0	62

De sandsynligste Værdier for Coefficienterne blive

$a = +0.^{mm}467,\ b = -0.11157,\ c = +0.06638,\ d = +0.00292$

og altsaa Formelen:

$N = A + 0.^{mm}47 - 0.1116\,T + 0.0664\,(760 - A) + 0.0029\,t.$

De efter denne Formel beregnede Værdier af $N - A$ ere opførte i ovenstaaende Tabel. Beregningen efter Formelen er gjort ved Hjelp af en grafisk Tabel, paa hvilken der med Argument A langs de horizontale Linier og Argument T langs de verticale, ere optrukne Linier, skraatløbende, for Værdierne af $a + b\,T + c\,(760 - A)$ for hver Tiendedel Millimeter fra $+ 1.^{mm}4$ til $- 3.^{mm}6$. Af denne Tabel kan saaledes den samlede Sum af disse Correctioner udtages, og hertil lægges Correctionen dt, der er regnet lig 0 fra 15de til og med 30te Juni, lig $+ 0.^{mm}1$ fra 1ste Juli til 5te August, og lig $+ 0.^{mm}2$ fra 6te August til 16de August. Denne sidste Correction udtrykker Forandringen af Aneroidbarometrets constante Correction, der, under Rejserne i 1877, ikke naaer op til $0.^{mm}2$. Vi have nemlig $0.00292 \times 62 = 0.18$. Af Rubrikken Obs. — Ber. i ovenstaaende Tabel beregnes Middelfejlen af en Sammenligning mellem Søbarometret og Aneroidbarometret, begge reducerede til sand Barometerhøjde efter de angivne Methoder, til $\pm 0.^{mm}177$.

Den midlere Fejl bliver $\varepsilon = \pm 0.^{mm}256$.
Den sandsynlige Fejl „ $\delta = \pm 0.^{mm}170$.

Den sandsynlige Fejl af en Sammenligning mellem Søbarometret Adie 1493 og det meteorologiske Instituts Normalbarometer er fundet lig $\pm 0.^{mm}063$. Herefter skulde den sandsynlige Fejl af en reduceret Observation af Aneroidbarometret ombord blive omtrent $\pm \sqrt{(0.170)^2 - (0.063)^2} = \pm 0.^{mm}158$. Jeg tror, at man maa være tilfreds med at kunne opnaa denne Nøjagtighed af Barometerobservationer tilsøs. Den er visselig lige saa stor som den, man vilde opnaa under gjennemsnitlige Vejrforhold med et Søbarometer, da dette enten er trægt, eller, i uroligt Vejr, pumper.

For at undersøge, om der mellem Iagttagernes (Styrmændenes) Aflæsninger af Aneroidbarometret og mine Aflæsninger er nogen constant Forskjel eller personlig Ligning, har jeg gaaet frem paa følgende Maade. De Observationer af Aneroidbarometret, jeg har noteret i det ovenbeskrevne Øjemed, — for at controllere Aneroidbarometret — paa de Dage, der gjordes Observationer ombord af Styrmændene, har jeg reduceret paa ovenangivne Maade og sammenstillet med Styrmændenes, i de meteorologiske Tabeller nedenfor for hver Time givne. Efter disse timevise Observationer var det ikke vanskeligt at interpolere Styrmændenes Observation til det Klokkeslet, da jeg tog min Observation. Resultatet af 40 saadanne Sammenstillinger er, at Styrmændene i Gjennemsnit have noteret Aneroidbarometret $0.^{mm}045$ lavere end jeg. Altsaa en umerkelig Forskjel. Middeltallet af Afvigelse mellem Styrmændenes og mine Aflæsninger er $\pm 0.^{mm}15$, en Størrelse, der er næsten ganske den samme som den ovenfor fundne sandsynlige Fejl

The most probable values for the coefficients, are

$a = +0.^{mm}467,\ b = -0.11157,\ c = +0.06638,\ d = 0.00292;$

and hence we have the formula: —

$N = A + 0.^{mm}47 - 0.1116\,T + 0.0664\,(760 - A) + 0.0029\,t.$

The values of $N - A$ computed from this formula are set forth in the above Table. The computation according to the said formula was made by means of a diagrammatic table, which, with the argument A along the horizontal lines, and the argument T along the vertical, gives a series of lines — oblique — representing the values of $a + b\,T + c\,(760 - A)$ for every tenth of a millimetre, from $+ 1.^{mm}4$ to $- 3.^{mm}6$. Hence, from this Table the whole sum of the said corrections can be found, to which must be added the correction dt, put $= 0$ from the 15th to (and including) the 30th of June; $= + 0.^{mm}1$ from the 1st of July to the 5th of August; and $= + 0.^{mm}2$ from the 6th to the 16th of August. The latter correction expresses the change in the constant correction of the Aneroid barometer, which, on the cruises in 1877, did not reach $0.^{mm}2$. For we have $0.00292 \times 62 = 0.18$. From the Column "Obs. — Comp." in the above Table, the mean error of a comparison between the marine barometer and the Aneroid barometer, both reduced to true barometric pressure by the methods previously described, is computed at $\pm 0.^{mm}177$.

The mean error becomes $\varepsilon = \pm 0.^{mm}256$.
The probable error „ $\delta = \pm 0.^{mm}170$.

The probable error of a comparison between the marine barometer Adie No. 1493 and the standard barometer of the Meteorological Institute, has been found $= \pm 0.^{mm}063$. Hence, the probable error of a reduced observation of the Aneroid barometer on board, should be about $\pm \sqrt{(0.170)^2 - (0.063)^2} = \pm 0.^{mm}158$. This degree of accuracy may, I think, be regarded as satisfactory. It is, at least, quite equal to that attainable during average weather with a marine barometer, which is anything but sensitive, or, in boisterous weather, is given to pump.

With a view to investigate whether a constant difference, or personal equation, actually exists between the observers' (the mates') readings of the Aneroid barometer and my own, I proceeded in the following manner: — The observations of the Aneroid barometer — taken with the object specified above, viz. to control that instrument — which I have noted down on the days when observations were made on board by the mates, I have reduced, as described above, and compared with those of the mates, entered in the Meteorological Tables given below for every hour. From these hourly observations, it was not difficult to interpolate the observations of the mates for the hour when I took my observation. The result of 40 such comparisons is, that the mates, on an average, have noted the readings of the Aneroid barometer $0.^{mm}045$ lower than I have done — a well-nigh inappreciable difference. The mean difference between the indications read off by the mates and by myself, is $\pm 0.^{mm}15$, a value almost exactly

af en Observation af Aneroidbarometret. Den støtste Afvigelse mellem os er 0.^{mm}4.

De i Observationstabellerne opførte Barometerhøjder for 1877 ere Styrmændenes Noteringer af Aneroidbarometret, reducerede til sand Barometerhøjde ved Havets Overflade efter de her beskrevne Methoder.

I 1878 anvendtes de samme Barometre, paa den samme Plads ombord og de samme Control- og Reductionsmethoder som i 1877.

Som Rejsenormal medfulgte Stationsbarometer Adie No. 1506, hvis Correction fandtes i Christiania

— 0.^{mm}41 i Mai 1878.
— 0. 37 i Oct. 1878.

Den første Værdi er anvendt. Desuden medfulgte Expeditionen et Fortinsk Barometer af Sécrétan, der oftere observeredes ved Siden af Adie 1506, naar Skibet laa roligt, tilsyneladende uden verticale Bevægelser. Dette sidste var en aldeles nødvendig Betingelse for, at det Fortinske Barometer skulde kunne benyttes. Der skulde meget liden vertical Bevægelse til at bringe dette Instrument til at pumpe. Barometret Sécrétan stemte, naar dets i Christiania bestemte constante Correction anvendtes, ret godt med Adie 1506. Men som Controlbarometer var det, ophængt ombord i et Fartøj i Havne, som Hammerfest, hvor der næsten altid er en Smule Dynning, ikke fuldt tjenligt, hvorfor jeg ved Beregningen ikke har taget Hensyn til de med samme gjorte Observationer. Stationsbarometret Adie No. 1506 (Kew Model) derimod, var fortrinlig skikket til dette Brug, da dets Rør er indsnevret saa vidt, at det taaler en ganske svag Dynning uden at pumpe, paa samme Tid som det er langt følsommere end et Søbarometer. Observationerne med Sécrétan vare dog forsaavidt af Værd, som de tjente til Control for, at Adie 1506 var i fuld brugbar Stand.

De første Controlbestemmelser gjordes den 26de Juni i Vardø, hvor Søbarometret observeredes ombord, medens jeg under Inspection af den meteorologiske Station sammesteds observerede Sécrétan i Land. Begge Barometres Angivelser, reducerede til samme Øjeblik og samme Niveau, gave for Søbarometret en Correction af — 0.^{mm}62. Da disse Sammenligninger ikke vare directe, har jeg ikke medtaget dem i den følgende Tabel, ihvorvel deres Resultat kommer overens med det definitive. Den følgende Tabel giver de Værdier af Søbarometrets Correction, der ere fundne af directe Sammenligninger ombord, hvor begge Barometre hang ved Siden af hverandre. Rubrikken "Lufttryk" er Observationerne af Adie 1506, reducerede til 0^{0}, og formindskede med 0.^{mm}41.

equal to the probable error, given above, of one observation of the Aneroid barometer. The greatest deviation occurring between my observations and those of the mates, is 0.^{mm}4.

The height of the barometer given in the Observation Tables for 1877, is the mates' readings of the Aneroid reduced to true barometric pressure at the sea-level, according to the methods here set forth.

In 1878, the same barometers were made use of, mounted in the same place on board, and the same methods of control and reduction applied as in 1877.

As a travelling standard barometer, was taken out on the Expedition the station barometer Adie No. 1506, the correction for which had been found in Christiania to be

— 0.^{mm}41 in May 1878, and
— 0. 37 in Oct. 1878.

The first of these values was applied. Moreover, a Fortin's barometer, by Sécrétan, was also taken out on the Expedition, the readings of which were also noted and compared with those of Adie No. 1506, when the vessel lay well-nigh motionless, and apparently without any vertical movement. The latter condition was indispensible to admit of observing the Fortin barometer. An exceedingly slight vertical movement would cause the said instrument to pump. The barometer Sécrétan was, on applying its constant correction, determined in Christiania, found to agree pretty well with Adie No. 1506. Meanwhile, as a control barometer, mounted on board a vessel in port, — Hammerfest, for instance, — where there is almost always a little swell, it did not prove thoroughly serviceable; and hence, in making the computations, I had no regard to the observations taken with the said instrument. The standard barometer Adie No. 1506 (Kew model) was, on the other hand, excellently adapted for that purpose, its tube being so far contracted, that it will bear a slight swell without pumping, and is besides far more sensitive than a marine barometer. The observations taken with the Sécrétan instrument proved, however, so far of value, as they served to show, that the Adie barometer No. 1506 was in good order.

The first control determinations were made on the 26th of June, at Vardø, where the marine barometer was observed on board, while I, when engaged in inspecting the Meteorological Station of that place, observed the Sécrétan instrument on shore. The readings of both barometers, reduced to the same moment and to the same level, gave for the marine barometer a correction of — 0.^{mm}62. These comparisons, however, not having been undertaken direct, I have not included them in the following Table, notwithstanding their result agrees with that definitively found. The following Table gives the values of the correction determined for the marine barometer by direct comparison on board, where the two instruments were mounted side by side. The Column "Pressure" contains the observations taken with Adie No. 1506, reduced to 0^{0} and diminished with 0.^{mm}41.

1878.		Lufttryk *(Pressure).*	Corr. for Adie 1493.
Juli 8	Hammerfest	759.4^{mm}	— 0.58^{mm}
(July) „	„	59.7	— 0.64
„ 9	„	60.3	— 0.61
„ 10	„	59.1	— 0.82
„ 11	„	58.4	— 0.69
„ 13	„	55.3	— 0.73
„ 26	„	56.1	— 0.60
„ 27	„	59.9	— 0.57
„ „	„	60.3	— 0.57
„ 29	„	62.0	— 0.66
„ „	„	62.1	— 0.75
Aug. 22	Advent Bay	49.3	— 0.79
„ „	„	49.4	— 0.87
„ 27	Tromsø	53.7	— 0.68
„ „	„	54.0	— 0.57
„ 28	„	55.9	— 0.49
Middel *(Mean)*		757.2	— 0.66 (MF = ± 0.09^{mm}).
Reduction til Havfladen *(to the Sea-level)*			+ 0.13
Correction i *(in)* 1878			— 0.53

Søbarometrets Correction synes saaledes fremdeles at være steget ganske lidt siden 1877. Til Beregning af Observationerne fra 1878 er anvendt Correctionen — 0.^{mm}5, som i 1877.

Det samme Aneroidbarometer, som brugtes i 1877, opstilledes i 1878 paa samme Plads. Det controlleredes ganske paa samme Maade som Aaret forud, og benyttedes til de daglige timevise Iagttagelser.

Den 11te August, mellem Kl. 1 og 2 p. m. blev jeg gjort opmerksom paa, at Viseren paa dette Aneroidbarometer — som jeg kalder Aneroid A —, der om Formiddagen og indtil Kl. 1 Eftm. havde vist, med smaa Variationer, paa lidt over 754^{mm}, pludselig var sprungen til over 770^{mm}. Nogen ydre Foranledning hertil kunde ikke opdages. Et andet Aneroidbarometer, som jeg kalder Aneroid B, af samme Construction som A, opstilledes istedetfor dette og benyttedes til Rejsens Ende. Da den første Observation med B, Kl. 2 Eftm. og de følgende Observationer viste et Sprang mellem Kl. 1 og 2 af 1.^{mm}5 Fald, der var højst usandsynligt efter Barometrets rolige Gang forresten, antoges A at have forandret sin Correction jevnt med Tiden fra Kl. 2 Morgen af, til efter Kl. 1, saaledes at Spranget elimineres, og herefter rettedes de Observationer, der falde mellem disse Klokkeslet.

De følgende Tabeller indeholde Resultaterne af de Sammenligninger, der i 1878 tjente til at controllere Aneroidbarometrene og til at beregne Formelen for deres Reduction til sand Barometerhøjde ved Havets Overflade.

The correction of the marine barometer would, therefore, appear to have still risen very slightly since 1877. For computing the observations taken in 1878, I have applied the correction — 0.^{mm}5, as in 1877.

The Aneroid barometer used in 1877 was again mounted in the same place in 1878. It was controlled precisely in the same manner as the year before, and used for the hourly observations.

On the 11th of August, between 1 and 2 p. m., my attention was called to the hand of the Aneroid barometer (I shall call this instrument Aneroid A), which during the whole forenoon and as late as 1 p. m. had pointed, with but trifling variations, a trifle above 754^{mm}, having suddenly sprung up to a little above 770^{mm}. No external cause to account for this could be detected. Another Aneroid barometer, which I shall call Aneroid B, of the same construction as Aneroid A, was mounted in place of the latter and used throughout the remainder of the cruise. The first observation with Aneroid B, taken at 2 p. m., and the following observations, showing between 1 and 2 p. m. a sudden fall of 1.^{mm}5, exceedingly improbable considering the slight variation of pressure before and after, Aneroid A was assumed to have uniformly changed its correction during the interval from 2 a. m. till after 1 p. m., thus eliminating the fall; and hence the observations taken between the said hours were brought in accordance with this supposition.

The following Tables contain the results of the comparisons which in 1878 served to control the readings of the Aneroid barometers, and to compute the formula for their reduction to true barometric pressure at the sea-level.

Aneroid A.

Datum. (Date).	N	T	A	$N-A$ obs.	$N-A$ ber. (comp.)	Obs. — Ber. (Obs. — Comp.)	t
Juni 27	758.2^{mm}	10.°9	759.0^{mm}	— 0.8^{mm}	— 0.4^{mm}	— 0.4^{mm}	0
Juli 2	53.1	5.9	53.0	+ 0.1	+ 0.4	— 0.3	5
(July) 3	51.7	4.5	50.9	+ 0.8	+ 0.7	+ 0.1	6
4	50.7	4.5	50.0	+ 0.7	+ 0.7	0.0	7
5	49.8	10.0	49.8	0.0	+ 0.1	— 0.1	8
„	49.4	14.5	49.9	— 0.5	— 0.4	— 0.1	8
6	49.6	9.0	49.3	+ 0.3	+ 0.2	+ 0.1	9
7	49.3	10.3	49.2	+ 0.1	+ 0.3	— 0.2	10
8	56.3	10.5	56.7	— 0.4	— 0.3	— 0.1	11
9	60.4	10.2	60.6	— 0.2	— 0.5	+ 0.3	12
11	58.7	12.0	58.9	— 0.2	— 0.7	+ 0.5	14
13	56.0	20.1	57.6	— 1.6	— 1.5	— 0.1	16
14	55.7	10.0	55.7	0.0	— 0.3	+ 0.3	17
15	55.4	11.2	55.6	— 0.2	— 0.4	+ 0.2	18
„	53.1	12.9	53.4	— 0.3	— 0.5	+ 0.2	18
16	50.8	7.2	50.3	+ 0.5	+ 0.3	+ 0.2	19
„	45.6	8.5	45.3	+ 0.3	+ 0.4	— 0.1	19
17	42.0	6.2	41.3	+ 0.7	+ 0.9	— 0.2	20
„	40.9	7.0	40.0	+ 0.9	+ 0.8	+ 0.1	20
„	45.0	3.9	43.8	+ 1.2	+ 1.0	+ 0.2	20
18	46.1	5.5	45.5	+ 0.6	+ 0.7	— 0.1	21
20	56.0	6.3	55.8	+ 0.2	+ 0.1	+ 0.1	23
„	56.9	6.5	56.9	0.0	0.0	0.0	23
21	56.8	8.3	56.9	— 0.1	— 0.2	+ 0.1	24
22	54.6	6.1	54.5	+ 0.1	+ 0.1	0.0	25
23	54.4	5.0	54.1	+ 0.3	+ 0.3	0.0	25
26	56.2	8.2	56.1	+ 0.1	— 0.2	+ 0.3	29
27	60.0	11.0	60.3	— 0.3	— 0.8	+ 0.5	30
30	61.4	10.9	62.2	— 0.8	— 0.9	+ 0.1	33
31	60.1	9.9	61.0	— 0.9	— 0.7	— 0.2	34
„	54.4	8.9	54.8	— 0.4	— 0.3	— 0.1	34
Aug. 1	57.1	6.9	57.2	— 0.1	— 0.2	+ 0.1	35
2	51.0	6.0	50.9	+ 0.1	+ 0.2	— 0.1	36
4	65.1	8.6	66.1	— 1.0	— 0.9	— 0.1	38
5	62.5	5.2	63.0	— 0.5	— 0.4	— 0.1	39
6	62.6	6.0	63.1	— 0.5	— 0.5	0.0	40
8	56.1	6.1	56.2	— 0.1	— 0.1	0.0	42
9	62.0	6.1	62.9	— 0.9	— 0.5	— 0.4	43
10	58.0	5.0	58.1	— 0.1	— 0.1	0.0	44

Formel (*Formula*): $N = A + 0.^{mm}75 - 0.1078\, T + 0.0534\,(760 - A) - 0.0103\, t.$

$\varepsilon = \pm\, 0.^{mm}218, \quad \delta = \pm\, 0.^{mm}145.$

Man ser, at Coefficienterne for Temperatur og Stand ere meget nær de samme som det foregaaende Aar. Den constante Correction er lidt større, og dens Variation med Tiden er merkelig forøget. Den sandsynlige Fejl af en Sammenligning er ganske lidt mindre i 1878 end i 1877.

We see that the coefficients for temperature and height are very nearly the same as the year before. The constant correction is a trifle greater, and its variation during the cruise has increased considerably. The probable error of a comparison was very slightly smaller in 1878 than in 1877.

Aneroid B.

Datum (Date).		N	T	A	$N-A$ obs.	$N-A$ ber. (comp.)	Obs. — Ber. (Obs. — Comp.)	t
Aug.	11	753.6 mm	7.°7	755.6 mm	— 2.0 mm	— 2.1 mm	+ 0.1 mm	0
	12	55.2	9. 7	57.0	— 1.8	— 1.8	0.0	1
	14	56.9	5. 2	59.9	— 3.0	— 2.7	— 0.3	3
	15	57.7	5. 1	60.3	— 2.6	— 2.8	+ 0.2	4
	16	56.1	5. 5	58.8	— 2.7	— 2.6	— 0.1	5
	17	53.4	6. 9	55.3	— 1.9	— 2.2	+ 0.3	6
	18	53.6	8. 5	55.5	— 1.9	— 1.9	0.0	7
	19	54.2	5. 6	56.5	— 2.3	— 2.4	+ 0.1	8
	21	51.2	5. 0	53.6	— 2.4	— 2.4	0.0	10
	22	49.4	6. 8	51.5	— 2.1	— 1.9	— 0.2	11
	23	49.3	6. 0	51.2	— 1.9	— 2.0	+ 0.1	12
	24	45.1	4. 8	47.1	— 2.0	— 2.0	0.0	13

Formel (*Formula*): $N = A - 3.^{mm}72 + 0.1801\,T + 0.0503\,(760 - A) + 0.0129\,t.$

$\varepsilon = \pm\, 0.^{mm}177,\ \delta = \pm\, 0.^{mm}118.$

Aneroidbarometret B har herefter været meget tjenligt, og fuldkommen saa godt som A.

Sammenligningen mellem Styrmændenes og mine Aflæsninger af Aneroidbarometrene i 1878 giver følgende Resultat. I Gjennemsnit have Styrmændene noteret $0.^{mm}002$ lavere end jeg, altsaa en umerkelig Forskjel. Den midlere Afvigelse mellem os er $\pm\, 0.^{mm}09$ og den største er $\pm\, 0.^{mm}3$.

1878 Aars Barometerobservationer have saaledes i alle Henseender mindst ligesaa stor Sikkerhed som 1877 Aars. Efter disse Erfaringer om Aneroidbarometrenes Brug til Observationer tilsøs tør jeg trygt anbefale at bruge dem, under Forudsætning af, at der udøves en stadig Control med dem. Hurtig og bekvem Aflæsning med en tilstrækkelig Præcision ($0.^{mm}1$), i alle Tilfælder, selv under meget oprørt Hav, Lethed at anbringe paa et for Observator bekvemt Sted, Følsomhed for Lufttrykkets Variationer ere Fordele, som Kviksølvbarometret ikke kan præstere i lige Grad som Aneroidbarometret ombord i et Skib. Den største Nøjagtighed vindes ved at bruge Aneroidbarometret som Observations- og Variationsapparat, og, under dertil egnede Forhold, at bruge Kviksølvbarometret som absolut Lufttryksmaaler til Bestemmelse af Variationsapparatets Constanter og deres Variation med Tiden — samme Princip som ved Bestemmelsen af Jordmagnetismens Elementer.

Ved Beregningen af Constanterne i Formelen for Aneroidbarometrets Reduction til Kviksølvbarometret har jeg ikke taget Hensyn til, at Aneroidbarometret maaler Lufttrykkets Variationer uafhængig af Tyngden, medens Kviksølvhøjden, ved samme absolute Lufttryk, er omvendt proportional med Tyngdens Størrelse. I Formelen skulde istedetfor N, den normale Barometerhøjde, staa Ud-

The Aneroid barometer B proved, accordingly, a most serviceable instrument, and quite as good as Aneroid A.

A comparison between the mates' and my own readings of the Aneroid barometer in 1878, gave the following result. On an average, the mates were found to have noted $0.^{mm}002$ lower than I — an inappreciable difference. The mean deviation between our notations is $\pm\, 0.^{mm}09$, and the greatest $\pm\, 0.^{mm}3$.

The barometric observations taken in 1878 have, therefore, an accuracy quite as great as those taken in 1877.

From the experience thus derived in the use of Aneroid barometers at sea, I can safely recommend these instruments, provided they are submitted to constant control. Quick and easy reading, together with adequate precision ($0.^{mm}1$) in all cases, even in boisterous weather, facility of mounting the instrument in a convenient place for the observer, sensibility to the variations of pressure, — such are the advantages in regard to which the mercury barometer cannot compare with the Aneroid on board a vessel at sea. The greatest accuracy is attained by using the Aneroid barometer as an apparatus for observing the variations of pressure, and by using, under favourable circumstances, the mercury barometer to measure the absolute pressure for determining the constants of the variation apparatus, — the same principle, accordingly, as adopted for determining the elements of terrestrial magnetism.

When computing the constants in the formula for the reduction of the Aneroid to the mercury barometer, I have not had regard to the circumstance, that the Aneroid measures the variations of pressure independently of gravity, whereas the height of the mercury with the same absolute pressure is in inverse proportion to the intensity of gravity. In the formula, instead of N, the normal height of the

trykket for det absolute Lufttryk, eller $N(1 - 0.00259 \cos 2\varphi)$, hvor φ er Observationsstedets Bredde. Med andre Ord, den normale Barometerhøjde (den til 0^0 og Normalbarometret reducerede Kviksølvhøjde) skulde, for at bringes i Overensstemmelse med Aneroidbarometrets Angivelser, corrigeres med den af Observationsstedets Bredde afhængige Tyngdecorrection, $-N \times 0.00259 \cos 2\varphi$, en Størrelse, der paa vore Bredder altid er positiv og voxer med Bredden. Undladelsen af at tage det nævnte Hensyn har imidlertid ikke medført nogen Fejl af praktisk Betydning i Reductionen af Expeditionens Barometerhøjder, da de udførte Sammenligninger mellem begge Instrumenter ere blevne behandlede i Grupper, indenfor hvilke Observationsstedernes Bredde ikke varierer inden vide Grænser. I 1877 var den midlere Bredde af de Steder, hvor Sammenligningerne mellem Kviksølv- og Aneroidbarometret foretoges, $68.^{\circ}1$. Den gjennemsnitlige Forskjel mellem Tyngdecorrectionen ved en enkelt Sammenligning og ved denne Bredde er, uden Hensyn til Fortegn, $\pm 0.^{mm}066$ og den største forekommende Forskjel er $-0.^{mm}21$ (64° Bredde) og $+0.^{mm}13$ (paa 71° Bredde, ved Jan Mayen). I 1878 ere de tilsvarende Tal for Aneroidbarometer A: $73.^{\circ}6$, $\pm 0.^{mm}056$, $-0.^{mm}12$ ($70.^{\circ}6$) og $+0.^{mm}14$ ($77.^{\circ}9$), og for Aneroidbarometer B: $78.^{\circ}4$, $\pm 0.^{mm}027$, $-0.^{mm}11$ ($74.^{\circ}6$) og $+0.^{mm}04$ ($80.^{\circ}0$). Det vil sees, at disse Værdier for Middelafvigelsen gruppere sig i samme Orden som de ovenfor fundne Værdier af den sandsynlige Fejl af en enkelt Sammenligning mellem Aneroid- og Kviksølvbarometer (0.17, 0.14 og 0.11). Det er derfor sandsynligt, at de sidste vilde kunne formindskes noget ved Indførelsen af Tyngdecorrectionen. Ved Rejser, hvor Barometrene sammenlignes under forskjellige Bredder, bør, naar der er Spørgsmaal om en større Nøjagtighed, altid Tyngdecorrectionen tages med i Beregningen, en Fremgangsmaade, der overhovedet anbefaler sig ved sin rationelle Begrundelse, og som det er at haabe vil vinde gjennemgaaende Indgang i den meteorologiske Praxis.

3. Luftens Temperatur og Fugtighed.

Ombord i et mindre Dampskib er det ingen let Sag at finde en passende Plads for et Thermometer, der skal angive den rigtige Lufttemperatur. Den første Dag, vi vare under Damp, den 1ste Juni 1876, paa Vejen fra Bergen til Sognefjorden, en klar Solskinsdag, gik jeg med et Slyngethermometer rundt Skibets Dæk for at prøve alle mulige Steder som Plads for Thermometrene. Resultatet blev den følgende Ordning, der viste sig meget tilfredsstillende.

Begge Thermometre, det tørre og det vaade, opstilledes i et Hus af bronzeret Kobberblik, paa lignende Maade som ved det norske meteorologiske Instituts Stationer. Kobberhuset (Fig. 10) var 57 Cm. højt, 22 Cm. bredt og 15 Cm. dybt. Det havde pyramideformet Tag med Skorsten, Jalousier over hele Bagvæggen, over hele Døren (der vises lukket op i Figuren) og nedentil, i Højde med Thermometrenes Kugler, paa begge Siderne og paa Forsiden samt i Bunden. Thermometrene stode meget frit inde i dette Hus, idet de oventil gik gjennem Huller i en Tverbjelke af Træ, og nedentil hvilede i Bøjler af tyk Messingtraad, der vare indskruede i den midt efter Huset staaende verticale Træbjelke. I den nederste Del af Huset hang ved den Væg, der var nærmest det vaade Thermometer, en Kop med Vand, hvorfra en Væge sugede Vand til det vaade Thermometer.

barometer, should be substituted the expression for absolute pressure, or $N(1 - 0.00259 \cos 2\varphi)$, in which φ signifies the latitude of the place of observation. In other words, the normal height of the barometer (the height of the mercury, reduced to C^0 and to the standard barometer) should, to make it correspond with the indications of the Aneroid, be corrected with the gravity correction ($-N \times 0.00259 \cos 2\varphi$), which is dependent on the latitude of the place of observation, and which, in our latitudes, is always positive and increases with the latitude. Meanwhile, this omission has not given rise to any error of practical importance in the reduction of the readings of the barometer noted on the Expedition, since the comparisons between both instruments have been treated in groups, within which the latitude of the places of observation does not vary to any considerable extent. In 1877, the mean latitude of the localities in which I made the comparisons between the mercury and the Aneroid barometers, was $68.^{\circ}1$. The average difference between the gravity corrections for a single comparison and for the said latitude, is, without regard to sign, $\pm 0.^{mm}066$, and the greatest differences that occurred are $-0.^{mm}21$ (64° N. lat.) and $+0.^{mm}13$ (71° N. lat., off the Island of Jan Mayen). In 1878, the corresponding figures for the Aneroid barometer A are as follows: $73.^{\circ}6$, $\pm 0.^{mm}056$, $-0.^{mm}12$ ($70.^{\circ}6$), and $+0.^{mm}14$ ($77.^{\circ}9$), and for the Aneroid barometer B, $78.^{\circ}4$, $\pm 0.^{mm}027$, $-0.^{mm}11$ ($74.^{\circ}6$) and $+0.^{mm}04$ ($80.^{\circ}0$). It will be seen that these values for the mean deviation are ranged in the same order as the values, given above, of the probable error of a single comparison between the Aneroid and the mercury barometer (0.17, 0.14, and 0.11). Hence, it is probable that the latter might be somewhat diminished by introducing the correction for gravity. On voyages during which the barometers are compared in different latitudes, the correction for gravity should, when greater accuracy is desirable, be taken into account, a mode of procedure manifestly the most rational, and which, it is to be hoped, will in future be generally adopted in meteorological practice.

3. Temperature and Humidity of the Air.

On board a comparatively small steamer, it is no easy matter to find a good place for mounting a thermometer that has to indicate the true temperature of the air. The first day we were under steam, June 1st 1876, on our passage from Bergen to the Sognefjord, in bright sunshiny weather, I made the tour of the ship's deck with a sling thermometer, to try every available place in which the thermometers might be mounted. The result was the following arrangement, which proved in every respect satisfactory.

Both thermometers, the dry and the wet, were set up in a bronzed copper case, in the manner adopted at the Stations of the Norwegian Meteorological Institute. The copper case (Fig. 10) was 57^{cm} high, 22^{cm} broad, and 15^{cm} deep. It had a pyramidical-shaped roof, provided with a funnel, louvres across the whole of the hind wall, across the door (open in the figure), and below, on a level with the bulbs of the thermometers, on both sides, and in front, as also at the bottom. Within this case the thermometers had an exceedingly free position, passing as they did, above, through holes in a cross-piece of wood, and being supported below in rings of thick brass wire, screwed into the vertical cross-piece stretching through the middle of the case. In the lower part of the case, suspended near the wall nearest to the wet thermometer, hung a cup filled with water, from which a wick sucked up the fluid to the wet thermometer.

Kobberhuset med Thermometrene stod inde i et større Hus af Træ (Fig. 10), idet det hvilede paa Consoler, fastgjorte i dettes Væg, og holdtes fast med Klamper. Det ydre Træhus var af Bord, hvidmalet, 103 Cm. højt, 41 Cm. bredt, 33 Cm. dybt, aabent oventil og nedentil og forsynet med Dør.

Det Thermometerhus, som benyttedes til de daglige Observationer, var hejst op under Fokkestaget, som Fig. 1 viser. Der var intet Fokkestagsejl underslaaet. Thermometrene hang her 7 Meter over Havet, 4 Meter over Dækket. Thermometerhuset støttedes paa sin Plads af Barduner, der løb fra den nedre Ende af Huset og vare gjorte fast i Rækken, den ene om Styrbord, den anden om Bagbord. Naar Observation skulde tages, firedes Thermometerhuset hurtigt, men varsomt, ned til en passende Højde, der var reguleret ved den faste Part af Faldet, begge Døre aabnedes raskt, Tiendelene af Grader aflæstes paa begge Thermometre, derpaa de hele Grader, det eftersaaes, at det vaade Thermometer ikke manglede Vand, hvorpaa Dørene atter lukkedes og Apparatet hejsedes op paa Plads.

Denne Plads havde Thermometerhuset under alle 3 Aars Expeditioner. De eneste Forandringer, den var underkastet, vare, at den i 1876 var lidt nærmere Fokkemasten end i de to andre Aar, og at Huset, naar vi vare under Sejl med Bredfokken sat, bragtes noget forover af Bugen af dette Sejl.

Thermometrene vare saaledes beskyttede mod Sol, Nedbør og Sprøjt af Søen samt frit udsatte for Luftens Paavirkning fra alle Kanter.

Naar Vinden var ret forind, kunde man tænke sig, at Røgen fra Kabys-Skorstenen forud (vist i Fig. 1) kunde komme til at opvarme Thermometrene. Men denne Frygt viste sig ugrundet, hvorom jeg særligt overbeviste mig ved Hjelp af Slyngethermometret, hvorom mere nedenfor, i saadanne Tilfælder, da Røgen fra Kabysen gik agterover. I Almindelighed var desuden denne Røgs Virkning indover

Fig. 10.

The copper case containing the thermometers was enclosed in a larger case, of wood (Fig. 10), resting on brackets let into its side, and secured by means of clamps. The outer wooden case, made of boards and painted white, was $1.^{m}03$ high, 41^{cm} broad, and 33^{cm} deep, open above and below, and provided with a door.

The case containing the thermometers used for the daily observations was hoisted up under the fore stay, as shown in Fig. 1. There was no forestaysail bent. Here, the thermometers hung 7 metres above the sea and 4 metres above the deck. The thermometer screen was secured by means of guys, passing from the lower end of the case, and made fast to the railing, one on the starboard and the other on the port side of the vessel. When an observation had to be taken, the thermometer-case was rapidly but carefully lowered to the proper height, determined by the fixed length of the halyard, both doors were immediately opened, tenths of degrees read off on both thermometers, then the whole degrees, and the wet thermometer examined to see if it wanted water, after which the doors were again shut and the apparatus hoisted up to its place.

This place, the thermometer-case had on each of the three cruises of the Expedition. The only change lay in its being a little nearer the foremast in 1876 than in the two following years, and that, when the vessel was under sail, with the foresail set, it was brought a trifle forward by the bunt of the sail.

The thermometers were accordingly protected against sun, rain, and the spray of the sea, and on all sides freely exposed to the air.

With the wind right ahead, it might be supposed that the smoke from the galley-funnel (see Fig. 1) could warm the thermometers. But this fear proved groundless, a fact of which I fully convinced myself by testing the case in question with the sling thermometer — concerning which I shall have more to say in the sequel — when the smoke from the galley was carried right aft. Moreover, the effect

Dækket brudt ved et foran eller agtenfor Skorstenen ophængt Røgsejl, der enten fordelte Røgen eller nødte den til at stige saa højt tilvejrs, før den gik agterover, at den ikke rørte Thermometerhuset.

Med Vinden paa Bougen, tvers eller paa Laaringen kom Luftstrømmen altid frit fra Havet til Thermometerhuset. Med Vinden næsten eller ganske ret agterind kunde det tænkes, at det opvarmede Fartøj og navnlig Skorstenen kunde give den Luftstrøm, som naaede Thermometerhuset, en for høj Temperatur. Samtidige Iagttagelser af Thermometre, opstillede ganske paa lignende Maade agterud ved Roret (Fig. 2, *z*), viste imidlertid, at Thermometrene forud under Fokkestaget viste samme Temperatur som de agterud, naar Vinden var agterind. Dette Resultat skyldtes væsentlig den Højde, i hvilken Thermometrene forud hang, thi med Vinden forind viste Thermometrene agterud, der stode i Mandshøjde over Dækket, i Regelen højere end de forud.

De til Lufttemperaturens og Fugtighedens Bestemmelse benyttede Thermometre vare af Åderman i Stockholm. De vare hvert Aar sammenlignede i Christiania ved det meteorologiske Institut med Normal-Thermometer, der er os sendt fra Kew-Comiteen. De vare inddelte i $^1/_5$ Grad og de fundne Correctioner mindre end 0.°1. Til Thermometerhuset under Fokkestaget udvalgtes 2 Thermometre, hvis Correctioner vare under 0.°05.

I 1876 og tildels i 1877 gjorde jeg nogle sammenlignende Forsøg med Slyngethermometer og vort tørre Thermometer forud. Slyngethermometret svingedes oppe paa Forkant af Hytten, i samme Højde som Thermometret i sit Hus under Fokkestaget. Resultatet af disse Forsøg var følgende:

of such smoke was as a rule in a great measure counteracted by a smoke-sail hoisted either before or behind the galley-funnel, this sail either dissipating the smoke, or compelling it to ascend so far up before passing aft that it did not come in contact with the thermometer-case.

With the wind on the bow, on the beam, or on the quarter, the current of air reached the thermometer-case unopposed from the sea. With the wind almost or right aft, it might be supposed that the heated vessel, and more especially the funnel, could impart to the current of air on its reaching the thermometer-case too high a temperature. Simultaneous observations of thermometers mounted aft in proximity to the rudder (Fig. 2, *z*) precisely as described above, showed, however, that the thermometers under the fore stay indicated the same temperature as those mounted aft, when the wind came right over the taffrail. This result must be ascribed chiefly to the height at which the thermometers in the fore part of the vessel were suspended; for, with the wind right ahead, the thermometers at the stern of the vessel, 5 or 6 feet above the deck, indicated as a rule a higher temperature than those under the fore stay.

The thermometers used for determining the temperature and humidity of the air were by Åderman of Stockholm. They were each year compared in Christiania with the standard thermometer of the Meteorological Institute, presented by the Kew Committee. These instruments were graduated in fifths of a degree C., and the corrections did not amount to 0.°1. For the thermometer-case mounted under the fore stay, 2 thermometers were selected, for which the corrections were under 0.°05.

In 1876, and occasionally in 1877, I made comparative experiments with a sling thermometer and with the dry thermometer under the fore stay. The sling thermometer was swung on the fore part of the roundhouse, at the same height as the thermometer in its case under the fore stay. The result of these experiments was as follows: —

					Slyngetherm. (*Sling Therm.*) Corr.	Tørt. (*Dry.*) Therm.	Forskjel. (*Diff.*)	*y*
1876.	Juni	20.	1^h	pm.	11.°8	12.°2	— 0.°4	180°
	(June)	30.	0	pm.	12. 4	12. 7	— 0. 3	27
	Juli	2.	7	pm.	11. 7	12. 0	— 0. 3	35
	(July)	3.	7	pm.	11. 2	11. 0	+ 0. 2	101
	„	„	8	pm.	11. 1	10. 8	+ 0. 3	102
	„	7.	10	pm.	10. 0	10. 0	0. 0	24
1877.	Juni	14.	6	pm.	11. 3	11. 1	+ 0. 2	45
	(June)	15.	11	am.	9. 2	9. 1	+ 0. 1	0
	„	19.	5	pm.	6. 6	6. 5	+ 0. 1	22
	Middel *(Mean)*.						— 0.°01	

Slyngethermometret var inddelt i hele Grader. y er Vindens Vinkel med Kursen. Nogen bestemt Afhængighed af Forskjellen mellem begge Thermometre og Vinkelen y kan ikke sees. I Gjennemsnit vise begge den samme Temperatur. Middeltallet af Afvigelserne mellem begge, uden Hensyn til Fortegn, er $\pm 0.^{\circ}21$. Dette Tal er ikke større, end at det nok kan forklares af Observationsfejl, Correctionsfejl og virkelig Forskjel mellem Temperaturen i Thermometerhuset og over Hyttedækket. Forsøgene med Slyngethermometret modsige saaledes ikke den Antagelse, at Thermometret til Lufttemperaturen var anbragt paa en hensigtssvarende Maade og paa en heldig Plads.

For muligens at kunne controllere Psychrometerobservationerne medtog jeg et Daniell's Hygrometer, forfærdiget af Åderman i Stockholm. Dets Thermometre verificeredes af mig i Christiania. Det opstilledes, naar der gjordes Forsøg med det, paa Forkant af Hytten til Luvart. En Assistent aflæste paa givet Signal det indre Thermometer, medens jeg iagttog Duggens Tilsynekomst og Forsvinden. Begge stode vi i Læ af Instrumentet. Observationen af dette Instrument var ingenlunde let. Der skulde for hver Gang flere Forsøg til, førend jeg fandt den rette Mængde Æther, der gav et tydeligt Belæg af Dug, som kort efter forsvandt. Naar denne Mængde var funden, toges en Række Forsøg, af hvilke de nedenstaaende ere Middel. Jeg vil efter dette ikke tillægge disse Forsøg, ligesom heller ikke de ovenstaaende med Slyngethermometret, synderlig Vægt. Resultaterne af Forsøgene vare følgende:

The sling thermometer was graduated in whole degrees: y is the angle subtending between the direction of the wind and the ship's head. Any appreciable dependence of the difference between the two thermometers and the angle y cannot be detected. On an average, both were found to indicate the same temperature. The mean of the deviations between both, without regard to sign, is $\pm 0.^{\circ}21$. These figures are not greater than errors of observation, errors of correction, and the true difference in temperature within the thermometer-case and above the roof of the roundhouse, are amply sufficient to account for. Hence, the experiments with the sling thermometer do not oppose the supposition, that the thermometer for ascertaining the temperature of the air was mounted in a suitable manner and in a favourable place.

With the object of possibly controlling the psychrometer-observations, I took with me a Daniell's hygrometer, made by Åderman of Stockholm. The thermometers of this instrument I verified myself in Christiania. It was mounted, when experiments were to be taken, on the fore part of the roundhouse, to windward. An assistant read off at a given signal the inner thermometer, whilst I observed the formation and disappearance of the dew. Both of us stood on the lee side of the instrument. To observe with this instrument was no easy matter. On each occasion several experiments had to be made before I could find the quantity of ether that gave a perceptible coating of dew, which shortly after disappeared. Having found the said quantity, I made a series of experiments, of which those tabulated below are the mean results. To these experiments, as also to those with the sling thermometer, I will not attach any great value. The results were as follows: —

Dag. (*Day.*)	Psychrometer. Tørt. (*Dry.*)	Vaadt. (*Wet.*)	e_p	Daniell's Hygrom. Dugpunkt. (*Dew Point.*)	e_h	$e_h - e_p$	Vindhastighed, observeret. (*Velocity of Wind observed.*)
1876. Juni 22. 10^h 45^m am.	$13.^{0}5$	$12.^{0}6$	10.3^{mm}	$12.^{0}15$	10.6^{mm}	$+0.3^{mm}$	7^m pr. Sec.
(*June*) „ 7 0 pm.	14.9	13.9	11.2	13.5	11.5	+0.3	6
„ 30. 0 15 pm.	12.7	11.2	9.0	9.5	8.9	−0.1	7
Juli 2. 7 0 pm.	12.0	10.8	8.9	10.5	9.5	+0.6	14
(*July*) 8. 10 30 am.	11.4	10.6	9.1	9.0	8.6	−0.5	5
„ „ 1 30 pm.	11.9	11.1	9.4	9.4	8.8	−0.6	1
„ 25. 1 30 pm.	10.6	8.4	6.8	7.0	7.5	+0.7	7
„ 26. 6 45 pm.	10.25	9.35	8.2	8.5	8.3	+0.1	3
1877. Juni 14. 6 0 pm.	10.9	10.1	8.7	10.0	9.2	+0.5	7
Middel (*Mean*),			9.07^{mm}		9.21^{mm}	$+0.14^{mm}$	6.3^m

e_p er Vanddampenes Tryk beregnet efter Psychrometret (Jelinek's Tabeller), e_h Vanddampenes Tryk beregnet efter Dugpunktet.

e_p is the force of vapour computed from the psychrometer (Jelinek's Tables); e_h the force of vapour computed from the dew-point.

Der er Tegn til, at de større Vindhastigheder gjøre e_p for liden, og de mindre e_p for stor, saaledes som man kunde vente. Allerede en Vindhastighed af 6^m pr. Secund skulde gjøre e_p 0.^{mm}14 for liden, en Vindhastighed, der er lavere end den gjennemsnitlige i alle 3 Expeditionsaar. Det synes ikke, herefter at dømme, at Thermometrene have manglet det nødvendige Luftdrag. Medens saaledes denne Iagttagelse taler til Gunst for Nøjagtigheden af vore Lufttemperaturer, faa vore Fugtighedsbestemmelser finde sig i at være underkastede Virkningen af Psychrometrets Ufuldkommenhed. Denne Virkning har dog paa Søen vistnok mindre at betyde, da den relative Fugtighed altid er stor.

De i Observationstabellerne givne Værdier af Vanddampenes Tryk og den relative Fugtighed ere beregnede efter Psychrometeriagttagelserne ved Hjelp af Jelinek's Tabeller.

I 1876 og 1877 havde jeg, som allerede nævnt, et lignende Thermometerhus, som det under Fokkestaget, opstillet paa Agterdækket lige ved Roret. Da Thermometrene i dette viste overensstemmende med de forud i alle Tilfælder med Undtagelse af, naar Vinden var ret forind og hele Skibets Varme strømmede agterover, bleve Thermometrene agterud ikke aflæste til de regulære Observationstider, og i 1878 vare de ikke opstillede.

I 1876 havde jeg opstillet et Thermometerhus med Psychrometer, af den af Meteorological Office i London benyttede Model, paa Forkant af Hytten om Bagbord lige ved den Plads (Fig. 2, *y*), hvor man tog Vandets Temperatur. Dette Instrument viste en smuk Overensstemmelse med det under Fokkestaget hængende, *naar det var i Skygge,* men skinnede Solen det mindste paa Kassen, viste Thermometrene for højt. Da jeg ingen Anledning havde til at anbringe Skjærme mod Solen, blev Instrumentet ikke opstillet de følgende Aar.

---

4. **Skyernes Form** noteredes paa samme Maade som ved det meteorologiske Instituts Land-Stationer. (Howards Betegnelser).

5. **Skydækkets Størrelse** noteredes efter den sædvanlige Scala: 0 = klart, 10 = overskyet.

6. **Nedbørens Slags** noteredes for hver Time i en særskilt Rubrik, med specielle Betegnelser for dens Styrke.

Desuden noteredes i Anmerkningsrubrikken Nedbør, som faldt mellem Observationstiderne.

There are indications to the effect, that with greater wind-velocities e_p is too small, and with smaller wind-velocities too large, which was indeed to be expected. Even with a velocity of 6^m per second, e_p should be 0.^{mm}14 too small — a velocity lower than the mean for all three cruises of the Expedition. Hence, judging from this circumstance, the thermometers would not appear to have lacked the requisite draught of air. Thus, while this result argues in favour of the accuracy with which the temperature of the air was determined, we must, as regards our determinations of humidity be content to take them subject to the influence exerted by the imperfection of the psychrometer. This influence, however, at sea is of minor importance, the relative humidity being invariably great.

The values given in the Tables for the force of vapour and relative humidity were computed, according to Jelinek's Tables, from the observations taken with the psychrometer.

In 1876 and 1877, I had, as previously stated, a thermometer-case similar to that under the fore stay mounted close to the rudder. The thermometer in the said case having always indicated the same temperature as those under the fore stay, save when the wind came right ahead and the whole heat of the ship was carried aft, they were not read off at the regular hours of observation, and in 1878 they were not mounted.

In 1876, I set up a thermometer screen with a psychrometer, the identical model adopted by the Meteorological Office in London, on the fore bulkhead of the roundhouse (port side of the vessel), in immediate proximity to the place (see Fig. 2, *y*) where the temperature of the sea-water was taken. This instrument exhibited a remarkable agreement with that suspended under the fore stay, *when in the shade,* but if the sun shone ever so little on the case, the thermometers indicated too high a temperature. Being without the necessary means of screening off the sun, the instrument was not set up the following year.

---

4. The **Form of the Clouds** was noted in the same manner as at the Land Stations of the Meteorological Institute (Howard's Nomenclature).

5. The **Amount of Cloud** was noted according to the usual scale: 0 = clear, 10 = overcast.

6. The **Nature of the Precipitation** was noted every hour, and entered in a separate column, with speeial symbols to indicate its force.

Moreover, the nature of the precipitation that fell between the hours of observation was noted in the column for General Remarks.

7. Til at maale Nedbørens Mængde havde jeg opstillet en **Regnmaaler.** Den stod paa Agterdækket, ved Roret, (*z* Fig. 2) og hang i Slingrebøjler. Dens Overflade var 2 Meter over Dækket, 5 Meter over Havfladen. Dens Construction sees af Fig. 11. Aabningen var cirkelformet, 225 Kvadratcentimeter stor. Den var, efter den af Capt. *Hoffmeyer,* Bestyrer af det danske meteorologiske Institut, foreslaaede Model, forsynet med Tud og Hank. Maaleglasset var inddelt til at aflæse Regnhøjden i Millimeter.

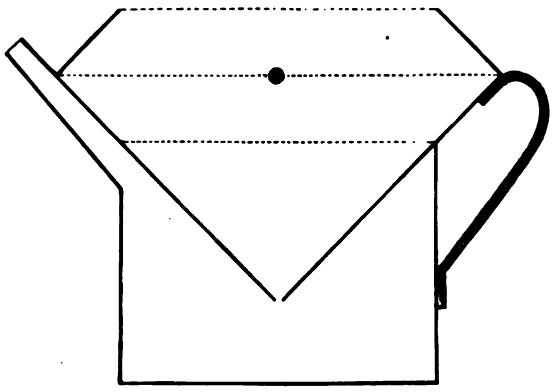


Fig. 11.

8. **Søgangens Retning** observeredes efter Compasset og corrigeredes for Deviation og Misvisning.

9. **Søgangens Styrke** noteredes efter den sædvanlige Scala: 0 = ganske roligt Hav, til 9 = det mest oprørte Hav. I 1876 forsøgte jeg nogle Gange at bestemme *Bølgernes Maximumshøjde,* ved fra Hyttedækket at iagttage det Øjeblik, da Bølgetoppen viste sig i Flugt med Horizonten samtidig med at Fartøjet var nederst i Bølgedalen, og maale Øjets Højde over Vandet i dette Øjeblik.

10. **Havvandets Temperatur** *i Overfladen* observeredes paa den Maade, at en Pøs Vand toges op i en Træpøs, paa Bagbord Side mellem Fokkevant og Hytten (*y* Fig. 2). Et Thermometer af Steger i Kiel, hvis Correction var mindre end 0.°05 C., inddelt i 1/5 Grad, sattes ned i Pøsen, og Temperaturen noteredes, saasnart det havde accomoderet sig, idet Instrumentet stadig forblev med sin nedre Del i Vandet. Accommoderingen varede 1/2 til 1 Minut.

Naar Expeditionen var i Søen eller ved ubeboede Kyster, gjordes de meteorologiske Iagttagelser regelmæssig hver Time, efter Skibsuret, der stilledes hver Middag efter sand Tid ombord. I norske Havne, ved Thorshavn og Reykjavik blev Observationernes Antal indskrænket til 3 eller 4 i Døgnet.

Observationerne udførtes af Styrmændene efter min Instrux. I 1876 observerede saaledes DHrr. *Harboe* og *Wilkens,* i 1877 DHrr. *Wilkens, Carlsen* og *Christensen* og i 1878 DHrr. *Krohn, Kaltenborn* og *Christensen.*

I 1876 reducerede jeg stadig ombord det foregaaende Døgns Observationer, og kunde saaledes controllere de gjorte Observationer. De følgende Aar vovede jeg ikke at udføre dette Arbejde ombord, da det havde vist sig at være altfor anstrængende, men havde dagligt Tilsyn med Observatio-

7. To measure the amount of the precipitation, I set up a **Rain-guage.** It was mounted on the afterdeck, close to the rudder (*z* Fig. 2), and hung in gimbals. The receiving surface was 2 metres above the deck and 5 metres above the sea-level. The construction of this instrument is shown in Fig. 11. Its opening was circular, measuring 225 square centimetres. The guage, provided with a spout and a handle, was on the model proposed for adoption by Captain *Hoffmeyer,* Director of the Danish Meteorological Institute. The measuring-glass of the instrument was graduated so as to admit of reading off the height of fallen rain in millimetres.

8. The **Direction of the Sea** was observed by the compass, and corrected for deviation and variation.

9. The **Disturbance of the Sea** was noted according to the usual scale, from 0 = a perfectly calm sea, to 9 = the roughest sea. In 1876 I tried on several occasions to determine *the maximum height of the waves,* by observing, from the roof of the deckhouse, the moment when the crest of a wave appeared on a level with the horizon, the vessel being in the trough of the sea, and then measuring the height of the eye above the water at the same moment.

10. The **Surface-Temperature** *of the Sea* was observed as follows: — A bucket of water was drawn on the port side, between the fore shrouds and the roundhouse (*y* Fig. 2). A thermometer, by Steger of Kiel (graduated in fifths of degrees), for which the correction was less than 0.°05 C., was immersed in the bucket, and the temperature noted so soon as the thermometer had had time to accomodate itself, the instrument remaining the whole time with its lower part in the water. The time required for the thermometer to take the temperature ranged from 1/2 to 1 minute.

When the Expedition was at sea or cruising off uninhabited coasts, the meteorological observations were taken regularly every hour by the ship's clock, which was set every day at noon to apparent solar time on board. In Norwegian harbours, at Thorshavn, and at Reykjavik, the number of observations was limited to 3 or 4 in twenty-four hours.

The observations were made by the mates, in accordance with instructions I had given them. In 1876, the observers were Mr. *Harboe* and Mr. *Wilkens;* in 1877, Mr. *Wilkens,* Mr. *Carlsen,* and Mr. *Christensen;* and in 1878, Mr. *Krohn,* Mr. *Kaltenborn,* and Mr. *Christensen.*

In 1876, I reduced on board the observations taken the day before, and could thus control the whole series. The two following years I did not venture to perform this work on board ship, which had proved of too laborious a character; every day, however, I superintended the observations, either

nernes Udførelse dels directe, medens de toges, dels ved at gjennemse Observationsblanketterne, som jeg opbevarede.

Samtlige Reductioner af Observationerne for 1877 og 1878, og de følgende Beregninger af Formlerne for de daglige Perioder ere udførte af Herr *A. Steen,* Første Assistent ved det meteorologiske Institut.

Den paaværende Plads for hver Time har jeg bestemt paa følgende Maade. Først afsattes paa et stort Kart (i Maalestokken 1:300000; 1′ = 0.^{mm}6) de af Capt. *Wille* bestemte Positioner for samtlige Loddestationer. Imellem disse blev Skibets Vej afsat efter Skibsjournalen. Efter de i denne indeholdte Opgaver over Tiden for Begyndelsen og Enden af en Lodning, en Skrabning eller en magnetisk Observation, samt over udsejlet Kurs og Distance for hver Time afsattes paa Kartet paaværende Plads for hver Time og de saaledes bestemte Bredder og Længder indførtes i de meteorologiske Tabeller. Idet jeg forøvrigt, angaaende Nøjagtigheden af de saaledes bestemte Bredder og Længder, henviser til Capt. Willes Afhandling i denne Generalberetning om Apparaterne og deres Brug,[1] Capitlet om Navigeringen, skal jeg her kun anføre, at den sandsynlige Fejl af en paaværende Plads er beregnet til at være mellem 1 og 2 Bueminutter (Kvartmil à $^{1}/_{60}$ Æquatorgrad), nærmest til lidt over 1 Minut.

De følgende **Tabeller** indeholde de meteorologiske Observationer, der gjordes paa Nordhavs-Expeditionen i Søen og i enkelte Havne.

Rubrik 1. *h.* *Klokkeslet,* regnet fra Midnat til Midnat. Klokkeslettet er noteret efter Skibsuret, der hver Middag stilledes til at vise sand Tid ombord.

„ 2. *φ.* Observationsstedets nordlige *Bredde.*

„ 3. *λ.* Observationsstedets *Længde,* regnet fra *Greenwich* Meridian, Østlig (E) eller Vestlig (W). I Havne er angivet disses Navn.

„ 4. *a.* *Vindens Retning* retvisende, paa nærmeste Compasstreg.

„ 5. *W.* *Vindens Hastighed,* i Meter pr. Secund.

„ 6. *b.* *Barometerhøjden,* i Millimeter, reduceret til 0.° C., Normalbarometret (corrigeret) i Christiania og Havets Overflade, men ikke til Højden ved 45° Bredde.

„ 7. *t.* *Luftens Temperatur* i Celsiusgrader.

„ 8. *e.* *Vanddampenes Tryk* efter Psychrometret, beregnet efter Jelineks Tabeller.

„ 9. *r.* *Relativ Fugtighed* efter Psychrometret, beregnet efter Jelineks Tabeller. 00 = 100 %.

[1] C. Wille. Apparaterne og deres Brug. Side 53.

direct, when being taken, or by going through the schedules the mates had filled out, and which I took care to preserve.

The reduction of all the observations taken in 1877 and 1878, together with the subsequent computation of the formulæ for the diurnal periods, were made by Mr. *A. Steen,* First Assistant at the Meteorological Institute.

The *Position of the Vessel for every Hour* I determined as follows: — On a large map, scale $\frac{1}{300000}$; 1′ = 0.^{mm}6, were first set off the positions of all the sounding-stations, determined by Captain *Wille.* Between these stations the course of the vessel was laid down according to the ship's logbook. From the entries in the logbook, giving the time for the commencement and termination of a sounding, a dredging operation, or a magnetical observation, as also course and distance run for every hour, the position of the vessel for every hour was set off on the map, and the latitudes and longitudes thus determined entered in the Meteorological Tables. For the rest, as regards the accuracy of the said latitudes and longitudes, I will refer to Capt. Wille's Memoir, published in this General Report, on the Apparatus, and how used,[1] Chapter on Navigation, and merely observe here, that the probable error of a position is computed to range between 1 and 2 minutes of arc (nautical mile = $^{1}/_{60}$ of an equatorial degree), and generally to be a little over one minute.

The following **Tables** contain the meteorological observations taken on the North-Atlantic Expedition at sea and in certain harbours.

Column 1. *h.* *Hour,* from midnight to midnight. The hour was taken from the ship's clock, which every day at noon was set to apparent time on board.

„ 2. *φ.* North *latitude* of place of observation.

„ 3. *λ.* *Longitude* of place of observation from the meridian of Greenwich, East (E) or West (W). When in harbour, the name of such is given.

„ 4. *a.* *Direction of Wind,* true, to the nearest point of the compass.

„ 5. *W.* *Velocity of Wind,* in metres per second.

„ 6. *b.* *Height of Barometer,* in millimetres, reduced to 0° C., the standard barometer (corrected) in Christiania and the sea-level, but not to the height in latitude 45°.

„ 7. *t.* *Temperature of the Air* in degrees centigrade.

„ 8. *e.* *Force of Aqueous Vapour* as found from the psychrometer, computed according to Jelinek's Tables.

„ 9. *r.* *Relative Humidity* as found from the psychrometer, computed according to Jelinek's Tables; 00 = 100 per cent.

[1] C. Wille. The Apparatus and how Used, p. 53.

Rubrik 10. *n.* *Skyernes Form.* Ci. = Cirrus, Cist. = Cirrostratus, Cicu. = Cirrocumulus, Cu. = Cumulus, Cust. = Cumulostratus, Str. = Stratus, Nim. = Nimbus. Mængden af de forskjellige Skyformer sees dels af Tallet for Skydækket, dels af Ordenen, i hvilken de forskjellige Skyformer ere anførte, idet de Former, der ere tilstede i størst Antal og Udbredelse, staa først, og de, som ere mindre fremtrædende, staa sidst.

„ 11. *q.* *Skydækket.* 0 = ganske klart, 5 = halvklart, 10 = ganske overskyet.

„ 12. *p.* *Nedbør,* dens Art. ● = Regn, ✱ = Sne, ●✱ = Slud, ≡ = Taage, ⩍ = Dug, *m* = disigt. Exponenter betegne lidet eller meget, som: ●° = lidt Regn, ●² = sterkt Regn. De samme Betegnelser anvendes i Anmerkningsrubrikken.

„ 13. *o.* *Regnmaaler.* Regnhøjden i Millimeter.

„ 14. *u.* *Søgangens Retning,* retvisende, efter 16 Compasstreger. NE = fra NE.

„ 15. *g.* *Søgangens Styrke.* 0 = Havblik, 1 = meget smult, 2 = smult, 3 = svag Dynning, 4 = nogen Sø, 5 = Megen Dynning, 6 = Høj Dynning, 7 = Hul Sø, 8 = Svært Hav, 9 = Svært oprørt Hav.

„ 16. *τ.* *Havfladens Temperatur* i Celsiusgrader.

„ 17. *Anmerkninger.* ● = Regn, ✱ = Sne, ●✱ = Slud, △ = Hagel, ≡ = Taage, ⁄ Sterke Vindbyger, ⊕ = Stor Ring om Solen, ⊙ = Solen af og til fremme, ⌒ = Regnbue, ≡●° = Taageregn, *b* = blaa Himmel, *d* = Fin Regn, ≡*g* = Tykt og Taaget, *m* = Disigt, ●*p* = Overtrækkende Regnbyger, *q* = ujevn Bris, Byget, horiz. = i Horizonten. Swell = Dynning, Confused Swell = Dynning fra flere Kanter. Elevated fog = Taage i Højden.

Column 10. *n.* *Form of Clouds:* — Ci. = cirrus, Cist. = cirrostratus, Cicu. = cirrocumulus, Cu. = cumulus, Cust. = cumulostratus, Str. = stratus, Nim. = nimbus. The amount of the different forms of cloud is seen partly from the number indicating the amount of cloud, and partly from the order in which the various forms of cloud are given, such forms as occur in greatest number and extent coming first, and those that are least frequent being noted last.

„ 11. *q.* *Amount of Cloud.* 0 = quite clear, 5 = half the sky clouded, 10 = entirely overcast.

„ 12. *p.* *Precipitation,* its nature. ● = rain, ✱ = snow, ●✱ = sleet ≡ = fog, ⩍ = dew, *m* = mist. The exponents to the right of the symbols signify little or much, as ●° = little rain, ●² = heavy rain. The same nomenclature is adopted in the Remark Column.

„ 13. *o.* *Rain-guage,* height of fallen rain in millimetres.

„ 14. *u.* *Direction of the Sea Disturbance,* true, on 16 points of the compass. NE = from NE.

„ 15. *g.* *State of the Sea.* 0 = calm, 1 = very smooth, 2 = smooth, 3 = slight, 4 = moderate, 5 = rather rough, 6 = rough, 7 = high, 8 = very high, 9 = tremendous.

„ 16. *τ.* *Temperature of Sea-surface* in degrees centigrade.

„ 17. *Remarks.* ● = rain, ✱ snow, ●✱ = sleet, △ = hail, ≡ = fog, ⁄ = wind squalls, ⊕ = solar halo, ⊙ = sun shining, ⌒ = rainbow, ≡●° = fog and drizzling rain, *b* = blue sky, *d* = drizzling rain, ≡*g* = fog and gloomy, *m* = mist, ●*p* = passing showers of rain, *q* = squally (wind), horiz. = in the horizon.

1876. June 22.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.																
2																
3																
4																
5																
6																
7																
8																
9																
10	62° 39′	2° 8′ E	SSE	3	770.2	13.6	10.3	89		0			SW	2	12.5	
11	62 35	2 21	S_bE	2	70.2	13.7	10.2	88		0			SW	2	11.8	
12	62 29	2 34	E_bN	3	70.6	14.2	10.4	87		0			SW	2	12.5	
1p.m.	62 24	2 46	NE_bE	4	70.6	15.2	11.2	87		0			SW	2	12.8	
2	62 22	2 54	SE	1	70.5	16.3	12.0	87		0			SW	1	13.3	
3	62 17	3 8	E_bS	0	71.4	16.0	11.5	85		0			SW	1	11.2	
4	62 15	3 20	NE	3	71.0	15.2	11.5	89		0			SW	1	12.2	
5	62 14	3 30	NE_bN	3	71.0	15.4	11.2	86		0			SW	1	13.0	
6	62 13	3 40	E_bN	3	70.8	16.1	11.6	85		0			SW	1	12.6	
7	62 15	3 51	N	4	71.1	14.6	11.0	89	Cicu.	2			SW	1	12.6	
8	62 16	4 6	N	8	71.0	14.7	9.2	74	Cicu. Ci.	2				1	13.0	
9	62 17	4 22	NNE	9	70.7	14.0	10.3	87	Ci.	0				1	12.0	
10	62 19	4 38	N_bE	9	70.3	13.5	10.1	88	Str.	1			NE	1	11.2	
11	62 21	4 54	N_bW	11	71.4	12.9	10.4	95		0			NE	1	12.1	*m* horiz.
12	62 27	5 6	N_bE	7	70.7	13.2	10.5	94		0			NE	1	12.7	m^o horiz.

1876. June 23.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	62 33	5 17 E	NE_bE	5	771.3	12.6	10.3	96		0			ENE	1	11.6	
2	62 40	5 30	NE	8	70.8	12.8	10.4	95		0			ENE	1	12.1	
3	62 46	5 40	NE	6	70.9	12.8	10.5	96		0			NNE	1	11.4	
4	62 51	5 50	NE_bN	3	70.9	12.9	10.4	95		0			NNE	1	12.4	
5	62 52	5 50	NE_bN	3	70.6	13.8	10.4	90		0			NNE	1	11.8	
6	62 52	5 50	NE_bN	2	70.6	13.7	10.3	89		0				0	12.8	m^o horiz.
7	62 52	5 50	NE_bN	4	70.9	14.3	10.8	90		0				0	12.8	m^o horiz.
8	62 52	5 50	NE	3	70.8	14.6	10.5	85		0				0	12.0	m^o horiz.
9	62 52	5 51	NE	6	70.8	14.8	10.6	85		0				1	12.2	m^o horiz.
10	62 53	5 52	N_bE	10	70.8	14.3	10.6	88		0				0	11.9	
11	62 55	6 8	N	7	70.4	14.0	10.7	91		0				0	12.8	
12	62 57	6 25	N_bE	6	70.4	14.0	11.1	94		0				0	12.9	
1p.m.	62 59	6 36	N_bE	11	70.1	13.9	11.1	95						0	15.2	
2	63 1	6 50	NW_bN	3	69.6	14.6	11.4	92						0	15.0	
3	63 2	7 5	NE_bE	4	69.2	15.8	11.2	84						0	15.5	
4																
5																
6																
7	Christiansund.															
8																
9																
10																
11																
12																

1876. June 27.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																Left Christiansund.
1p.m.																
2																
3	63 10	7 26 E	W_bN	4	761.1	12.4	10.0	94		0			WNW	1	10.8	≡ horiz.
4	63 10	7 11	NE	9	60.7	10.6	9.5	00		0	≡		NNE	1	10.4	≡ from 3^h 30^m.
5	63 10	6 56	NE_bN	8	60.3	10.6	9.5	00		0	≡		NNE	1	11.1	
6	63 10	6 40	NE	8	60.2	11.4	9.6	96	Ci. Cu.	0			NNE	1	10.8	5^h 45^m fog lifted from N.
7	63 10	6 30	N_bW	3	60.3	10.4	9.2	98	Ci. Cu.	0			NNE	1	10.0	$≡^o$ in S.
8	63 10	6 19	SW_bS	9	60.2	9.6	8.9	00		1	≡		NNE	1	10.2	
9	63 10	6 3	SSW	3	60.6	9.5	8.9	00	Cust.	10	≡		NNE	1	11.6	7^h 30^m Wind weared to SW with fog.
10	63 10	5 58	SW	2	60.3	10.0	9.2	00	Cust.	10	≡		NNE	2	11.7	
11	63 10	5 53	WSW	6	59.6	10.7	9.6	00	Cust.	10	$●^o$		N	2	11.7	≡ ●
12	63 10	5 48	WSW	6	58.7	11.0	9.7	99	Cust.	10	$●^o$		N	2	11.6	≡ ●

1876. June 28.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	63° 10′	5° 43′ E	SWbS	3	759.0	11.4	9.8	98	Cust.	10			SSW	2	11.8	≡ in W.
2	63 10	5 38	SWbW	4	59.0	11.6	9.9	98	Cust.	10			SSE	1	11.5	
3	63 10	5 36	SWbW	9	58.7	11.5	9.7	97	Cust.	10			S	2	11.4	/
4	63 10	5 25	SWbS	9	58.6	11.5	9.5	95	Cust.	10			SSW	2	11.8	q.
5	63 10	5 24	SW	9	59.2	11.4	9.4	95	Nim.	9			SW	2	11.6	
6	63 10	5 23	WSW	7	58.4	11.4	9.4	95	Nim.	9			SSW	2	11.6	
7	63 10	5 22	SSW	12	58.1	11.4	9.6	96	Cust.	10			SSW	3	11.2	
8	63 10	5 21	SWbS	11	58.2	11.4	9.8	98	Nim.	9			SSW	3	11.0	
9	63 10	5 20	SW	10	58.2	12.0	9.4	91	Cust. Cicu.	4			SSW	4	11.1	
10	63 10	5 19	SWbW	9	57.9	12.2	9.6	91	Cicu.	1			SW	4	11.2	
11	63 10	5 18	SWbS	8	57.9	12.2	9.6	91	Cust.	5			SW	4	11.0	
12	63 10	5 17	SSW	11	58.3	12.0	9.4	91	Cicu.	3			SSW	4	11.4	
1p.m.	63 10	5 16	WNW	9	57.9	12.2	10.0	95	Cust.	5			S	3	11.8	
2	63 10	5 16	SSW	7	57.9	12.1	9.4	90	Cust.	8			S	2	11.8	
3	63 9	5 16	SSW	7	57.7	12.2	10.5	99	Cust.	9			S	2	11.7	
4	63 8	5 16	SbW	6	57.7	11.0	9.7	99	Cust.	10			S	2	11.5	
5	63 7	5 17	SSW	7	57.2	11.3	9.6	97	Nim.	9	●°		SW	2	11.7	
6	63 7	5 17	SW	4	57.0	11.8	10.0	97	Nim.	8			SW	2	11.6	
7	63 7	5 17	SbW	3	57.0	11.5	9.7	97	Nim.	5			SSW	2	11.4	
8	63 7	5 17	SW	4	56.6	11.5	9.6	96	Nim.	5			SW	2	11.2	
9	63 8	5 16	SE	2	56.4	11.4	9.6	96	Cust.	7			SSW	2	11.5	
10	63 8	5 16	ESE	4	56.4	11.3	9.7	98	Cust.	8			SW	2	11.4	
11	63 8	5 16	SEbE	4	56.7	11.2	9.7	98	Cust.	8		1.7	SSW	2	11.0	
12	63 9	5 15	SEbE	4	56.4	11.2	9.5	97	Cust.	8			SSW	1	11 6	

1876. June 29.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	63 9	5 14 E	NEbE	2	756.8	11.0	9.4	96	Cust.	4			SW	2	11 4	
2	63 9	5 13	WbS	4	55.7	10.9	9.3	97	Cust.	6			SW	2	11.3	
3	63 9	5 13	WbS	2	55.6	11.1	9.4	95	Cust.	7			SW	2	11.4	
4	63 10	5 12	NEbE	5	55.6	11.2	9.3	94	Cust.	8			SW	2	11.4	
5	63 10	5 11	NNE	6	55.6	11.2	9.4	95	Cust. Ci.	8	●		SW	2	11.4	
6	63 10	5 4	NNE	8	55.9	11.1	8.6	87	Cust.	9	●		SW	1	11.7	
7	63 10	5 0	NNE	7	55.4	11.2	9.8	99	Cust.	9	●		NNE	1	11.5	
8	63 10	4 59	NEbN	4	55.7	11.2	9.7	98	Cust.	9	●		NE	1	11.5	
9	63 10	4 58	NNE	6	56.0	11.7	10.0	98	Cust.	10	●		W	1	11.7	
10	63 10	4 57	NbE	5	55.8	11.5	10.0	99	Cust.	10	●		W	1	11.6	
11	63 10	4 56	NbE	5	55.9	11.3	9.9	99	Cust.	10	●		W	1	11.6	
12	63 10	4 55	ENE	2	55.5	11.2	9.8	99	Cust.	10	●		W	1	11.6	
1p.m.	63 10	4 55	NNE	5	55.3	11.2	9.8	99	Cust.	10	●		W	1	11.6	
2	63 10	4 54	NE	8	56.3	11.0	9.4	96	Cust.	10	●		W	2	11.4	
3	63 10	4 53	NbE	9	56.0	11.0	9.5	97	Cust.	9			W	1	11.5	● horiz.
4	63 10	4 52	NE	4	56 1	11.6	9.2	91	Cust.	9			NNE	1	11.5	● horiz.
5	63 10	4 51	NEbN	9	56 0	11.4	9.1	91	Cust.	9			NNE	2	11.6	● horiz.
6	63 10	4 51	NEbN	10	56.0	11.4	9.1	91	Cust.	9			NNE	3	11.6	● horiz.
7	63 10	4 50	NEbN	9	56.0	11.2	8.7	88	Ci. Cust.	5			NNE	3	11.6	● horiz.
8	63 10	4 37	NNE	8	56.0	11.2	8.7	88	Cust.	7			NNE	3	11.0	
9	63 10	4 23	NNE	9	56.3	11.0	9.0	92	Cust.	7			NNE	3	11.1	
10	63 9	4 10	NEbN	7	56.7	11.3	9.9	99	Cust.	8		2.3	NNE	4	11.1	
11	63 9	3 56	NEbN	8	56.7	11.2	9.0	92	Cust.	8			NNE	5	11.2	
12	63 9	3 42	NEbN	7	56.8	11.2	8.9	90	Cust.	8			NNE	5	11.4	

1876. June 30.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	63 8	3 28 E	NNE	7	756.4	11.2	8.9	90	Cust.	8			NNE	5	11.8	● horiz.
2	63 7	3 14	NbE	13	56.1	11.1	9.0	91	Cust.	8			NNE	4	11.8	
3	63 6	3 1	NbE	9	56.2	11.1	8.9	90	Cust.	8			NNE	3	11.8	
4	63 5	3 1	NNE	7	56.1	11.0	9.0	92	Cust.	8			NNE	3	11.8	
5	63 5	3 0	NNE	6	56.4	11.2	8.6	86	Cust.	8			NNE	4	11.5	
6	63 5	2 59	NbE	7	56.3	11.2	8.4	85	Cust.	8			NNE	3	11.4	
7	63 5	2 57	NNE	5	56.6	11.5	8.5	85	Cust.	9			NNW	3	11.6	
8	63 5	2 56	NbE	5	56.2	11.9	9.0	89	Cust.	8			WNW	4	11.7	
9	63 4	2 54	N	6	56.1	12.4	8.9	85	Cust. Cu.	7			NNE	3	12.0	
10	63 4	2 52	NNE	7	56.3	13.0	9.6	87	Cust. Cu.	4			NNE	2	12.3	
11	63 4	2 50	NbE	6	56.3	13.0	10.6	96	Cust. Cu.	4			NNE	2	12.0	
12	63 4	2 48	N	7	56.2	12.8	9.2	85	Cust. Cu.	5			NNE	2	11.8	
1p.m.	63 4	2 47	NbE	7	56.1	12.8	9.3	86	Cust. Cu.	4			NNE	2	12.0	
2	63 4	2 46	NbE	4	56.1	12.6	9.8	91	Cust.	4			NNE	3	11.8	
3	63 4	2 45	NbE	6	55.9	11.9	9.0	89	Cust.	6			N	3	11.8	
4	63 3	2 44	N	5	55.8	12.0	9.2	89	Cust.	7			N	3	11.8	
5	63 3	2 43	N	4	55.5	11.8	9.3	91	Cust.	7			N	3	11.9	
6	63 3	2 42	NbE	3	55.8	12.0	9.4	91	Cust. Cu.	9			NNE	3	11.9	
7	63 3	2 41	NE	3	55.6	11.9	9.4	91	Cust.	9			NNE	3	12.1	
8	63 3	2 39	NE	3	55.5	11.8	9.2	90	Cust. Cu.	9			NNE	3	11.8	
9	63 3	2 25	NbW	4	55.2	11.8	9.1	88	Cust.	7			NNE	3	12.2	
10	63 3	2 10		0	55.5	11.2	8.7	88	Cust.	6			NNE	3	12.0	
11	63 4	1 55		0	55.0	11.2	8.7	88	Cust.	7			NNE	1	12.1	
12	63 4	1 38	SSW	3	54.7	11.0	8.8	90	Cust. Ci.	3			NNE	1	12.2	

1876. July 1.

h	φ	λ		a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	63° 5′	1° 22′	E	SSW	7	754.5	11.0	8.4	86	Ci.	8			NNE	2	12.0	
2	63 5	1 7		S_bE	6	54.2	11.1	8.4	85	Ci.	8			NNE	2	11.5	
3	63 5	0 51		S_bW	7	53.6	11.1	8.3	84	Ci.	9			NNE	2	11.8	
4	63 4	0 52		S_bW	10	53.6	11.2	8.6	86	Cust.	9			NNE	2	11.4	
5	63 4	0 53		SSW	10	53.0	12.0	8.2	79	Cust. Cicu.	3			NNE	1	12.1	
6	63 3	0 54		S_bW	10	52.7	11.6	8.9	88	Cust.	8			SSW	2	12.0	
7	63 3	0 55		S_bW	11	52.4	11.7	9.1	89	Cust. Ci.	8			SSW	3	12.2	
8	63 3	0 56		S_bW	11	52.5	12.2	9.3	89	Cust. Cicu.	4			SSW	4	12.2	
9	63 2	0 57		S_bE	13	52.3	12.4	9.7	91	Cust. Ci.	4			S	3	11.9	
10	63 2	0 58		S_bE	12	52.2	12.4	9.8	93	Cu. Ci.	6			S	3	12.2	
11	63 2	0 59		S_bE	12	52.4	12.4	9.7	91	Cu. Ci.	6			S	4	12.2	
12	63 2	0 59		S_bE	14	51.6	12.4	9.7	91	Cust. Ci.	3			S	5	12.2	Water blue.
1p.m.	63 2	0 59		S_bE	16	51.6	12.5	10.0	94	Ci. Cist. Cicu.	8			S	6	12.2	
2	63 2	0 59		S_bE	15	51.1	12.8	10.0	91	Cust.	8			SSE	6	12.2	
3	63 1	1 0		S_bE	13	50.7	12.5	10.1	95	Cust.	8			SSE	6	12.0	
4	63 0	1 4		SSE	17	50.0	12.4	10.0	94	Cust.	9			SSE	6	12.0	
5	62 58	1 10		SSE	15	49.5	12.2	10.1	96	Cust.	9			SSE	6	11.8	
6	62 56	1 18		SSE	18	49.0	12.2	10.1	96	Cust.	10			SSE	6	11.7	
7	62 56	1 22		SSE	17	48.3	12.3	10.3	97	Cust.	10	●		SSE	7	11.8	
8	62 55	1 26		SSE	17	47.9	12.2	10.3	98	Cust.	10	●		S	7	11.7	
9	62 54	1 30		S_bE	19	47.1	12.4	10.2	95	Cust.	10	●		S	7	11.4	
10	62 53	1 34		SSE	22	47.3	12.4	10.3	97	Cust.	10	●		S	7	11.5	Height of waves 5ᵐ to 6ᵐ.
11	62 52	1 38		S_bE	19	47.5	12.4	10.5	98	Cust.	10	●		S	7	11.4	
12	62 51	1 42		S_bE	19	47.3	11.6	9.9	98	Cust.	10	●		S	7	11.4	

1876. July 2.

h	φ	λ		a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	62 49	1 47	E	S_bE	19	747.3	12.0	10.5	00	Cust.	10	●		S	7	11.8	
2	62 48	1 51		S_bE	19	46.1	12.0	10.5	00	Cust.	10	●		S	7	11.9	
3	62 47	1 55		S_bE	19	46.4	12.0	10.5	00	Cust.	10	●		S	7	11.8	
4	62 46	2 0		S_bE	18	46.5	12.0	10.5	00	Cust.	10	●		S	7	11.8	
5	62 45	2 5		S_bW	13	47.3	11.9	10.3	99	Cust.	10	●		S	7	11.6	
6	62 44	2 10		S_bW	12	48.4	11.8	10.3	00	Cust.	9			S	7	11.4	
7	62 42	2 14		S_bW	16	48.6	11.8	10.1	98	Cust.	9	●°		S	7	11.2	
8	62 41	2 19		SSW	10	49.0	12.0	10.2	98	Cust.	8			S	7	11.3	
9	62 40	2 24		S_bW	11	49.9	12.0	10.2	98	Cust.	10	●°		SSW	7	11.3	≡ g.
10	62 39	2 31		SW_bS	10	50.4	11.4	10.1	00	Cust.	8			SSW	6	11.4	
11	62 37	2 37		SW_bS	7	51.2	11.7	10.1	99	Cust	8			SSW	6	11.5	
12	62 35	2 44		SW	8	51.8	11.5	10.0	99	Cust.	7		3.1	SSW	5	11.2	
1p.m.	62 33	2 42		S	8	52.7	12.2	10.5	99	Cist. Cust.	8			SW	5	11.4	⊙ b in W.
2	62 32	2 40		S_bW	11	52.7	12.2	9.1	87	Cust. Cu.	8			SW	5	11.5	
3	62 34	2 30		SSW	11	53.3	12.4	9.3	88	Cu. Ci.	5			SW	4	11.5	
4	62 36	2 19		SW_bS	10	53.4	12.4	9.7	91	Str.	5			SW	5	11.4	At 4.45 ●p.
5	62 39	2 8		SSW	10	53.7	11.9	9.5	93	Str. Cu.	2			SW	5	11.4	
6	62 41	1 58		SSW	9	53.7	11.8	9.6	94	Cu.	4			SW	5	11.4	
7	62 42	1 48		SW	12	53.7	12.0	8.9	86	Str. Cu.	2			SW	5	11.4	Height of waves 4ᵐ.
8	62 43	1 39		SW	10	54.4	11.5	9.0	89	Str. Cu.	2			SW	5	11.4	≡ in W.
9	62 44	1 31		SW	10	54.3	11.4	9.1	91	Nim.	3			SW	5	11.4	≡ in W.
10	62 45	1 22		SW	10	54.3	11.4	8.8	88	Cust.	2			SW	4	11.4	10ʰ—12ʰ ●p.
11	62 45	1 13		SW	10	54.4	11.4	9.1	91	Cust.	3			SW	4	11.4	
12	62 46	1 5		SW_bW	10	55.4	11.4	9.2	92	Cust.	2			SW	4	11.3	

1876. July 3.

h	φ	λ		a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	62 47	0 59	E	SW_bW	11	756.8	11.2	8.7	88	Cust.	7			SW	5	10.9	
2	62 47	0 51		SW_bW	10	56.6	11.2	8.9	90	Cust. Ci.	7			SW	5	10.9	●° 1½ʰ and 2¼ʰ.
3	62 48	0 44		SW_bW	10	56.4	11.3	9.1	92	Cust.	8			SW	5	11.2	●p in E.
4	62 48	0 37		SW	9	56.4	11.2	9.2	93	Cust.	9			SW	5	11.3	●p in S—W.
5	62 49	0 30		SW	8	56.7	11.2	9.2	93	Cust.	9			SW	4	11.1	●p in W.
6	62 49	0 22		SW	10	57.0	11.3	9.4	92	Cust.	9			SW	4	11.2	
7	62 50	0 15		SW_bW	11	57.4	11.1	9.4	95	Cust.	9			SW	4	11.2	●p in SSW.
8	62 50	0 7	E	SW_bW	11	58.0	10.4	9.4	00	Cust.	9			SW	4	11.4	●p in SSW
9	62 51	0 0		SW	10	58.1	10.6	9.0	95	Cust.	10	●		SW	4	11.3	●p in SSW.
10	62 52	0 7	W	SW_bW	7	58.7	11.2	8.9	90	Cust.	10	●		SW	4	10.9	
11	62 52	0 14		SW_bW	9	59.1	11.8	9.1	88	Cust.	10			SW	5	11.1	
12	62 53	0 22		WSW	7	59.0	11.8	9.1	88	Cust.	10	●°		SW	5	11.2	
1p.m.	62 52	0 30		SW_bW	6	59.3	11.7	8.6	85	Cust.	10			SW	5	11.2	
2	62 52	0 39		SW_bW	5	59.4	12.0	8.8	85	Cust.	9			SW	5	11.4	
3	62 52	0 48		SW_bW	9	59.3	10.9	8.6	89	Cust.	8	●°		SW	5	11.3	
4	62 52	0 57		SSW	7	58.8	11.6	9.3	92	Cust.	8			WSW	5	11.3	
5	62 56	1 5		SSW	7	58.5	11.4	9.3	93	Cu. Cust. Cist.	9			W	5	11.2	⊕
6	63 2	1 12		SSW	6	58.5	11.2	8.9	90	Cu. Cust. Cist.	9			W	5	11.1	Height of waves 3ᵐ.
7	63 2	1 12		S_bW	10	58.3	11.0	8.9	91	Cust. Cist. Nim.	9			SW	5	11.1	
8	63 2.	1 12		S	8	58.4	10.8	8.7	90	Cust.	10			SW	5	11.0	
9	63 2	1 13		S	8	58.4	10.8	9.0	94	Cust.	10			SSW	5	10.8	
10	63 3	1 14		S	10	57.7	11.0	8.9	91	Cust.	10			SSW	5	10.8	
11	63 3	1 15		S	8	58.3	11.0	9.2	94	Cust.	9			SSW	4	10.8	
12	63 4	1 16		S_bE	11	57.4	11.1	9.1	93	Cust.	8			SSW	4	10.8	

1876. July 4.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	r	Remarks.
1a.m.	63° 4′	1° 18′ W	SSE	10	756.6	11.0	9.0	92	Cust.	8			SW	5	10.8	
2	63 4	1 19	SE$_b$E	10	55.9	11.0	9.0	92	Cust.	9			SW	4	10.8	Swell from E.
3	63 5	1 20	ESE	9	55.5	11.1	9.1	93	Cust.	9			SW	4	10.6	Swell from E.
4	63 5	1 21	E$_b$S	10	55.1	11.1	9.2	94	Cust. Nim.	9			SW	4	10.6	●p in SW.
5	63 6	1 22	SE	11	55.5	11.1	9.4	95	Cust.	10	●		S	4	10.6	
6	63 6	1 24	SE$_b$S	6	56.8	10.6	9.3	98	Cust.	10	●		S	4	10.4	
7	63 7	1 26	ESE	6	54.4	10.6	9.3	98	Cust.	10	●		S	4	10.4	
8	63 7	1 26	ESE	11	54.2	10.5	8.9	94	Cust.	10	●		S	4	10.4	
9	63 8	1 26	E$_b$S	12	53.7	10.4	9.2	98	Cust.	10	●		ESE	4	10.5	
10	63 8	1 26	E$_b$S	11	53.6	10.8	9.4	98	Cust.	10	●		SE	4	10.8	
11	63 9	1 27	E$_b$S	9	53.7	10.8	9.5	99	Cust.	10	●		SE	4	11.0	
12	63 9	1 26	E$_b$S	13	53.7	10.4	9.4	00	Cust.	10	●		SE	4	10.8	
1p.m.	63 10	1 26	E	12	53.7	10.6	9.3	98	Cust.	10	●		S	4	10.8	Confused Swell.
2	63 10	1 26	E	8	53.4	10.8	9.4	98	Cust.	10	●		SE	5	10.8	
3	63 11	1 26	E	12	53.6	10.8	9.5	99	Cust.	10			SE	5	10.6	
4	63 11	1 26	E$_b$S	9	53.6	11.1	9.7	99	Cust.	10			SE	6	10.6	
5	63 12	1 26	E$_b$S	12	53.6	10.8	9.2	95	Cust.	10	●		SE	6	10.5	
6	63 12	1 26	ESE	12	53.6	10.6	9.0	95	Cust.	10	●		SE	6	10.4	
7	63 13	1 26	ESE	11	53.6	10.4	9.4	00	Cust.	10	≡●		SE	6	10.5	Swell from SE, less swell from ESE for Wind.
8	63 13	1 27	ESE	11	53.6	10.4	9.4	00	Cust.	10	≡●°		SE	6	10.5	
9	63 14	1 27	ESE	13	53.3	10.4	9.4	00	Cust.	10	≡●°		SE	5	10.5	
10	63 14	1 27	SE$_b$E	10	53.3	10.4	9.4	00	Cust.	10	≡●°		SE	5	10.5	
11	63 15	1 27	SE$_b$E	10	53.6	10.5	9.5	00	Cust.	10		6.0	SE	5	10.7	
12	63 15	1 27	ESE	9	53.5	10.6	9.5	00	Cust.	10			SE	5	10.7	

1876. July 5.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	r	Remarks.
1a.m.	63 15	1 27 W	ENE	8	753.8	10.8	9.4	98	Cust.	10			SE	5	10.7	
2	63 16	1 28	ENE	8	53.7	10.7	9.5	99	Cust.	10			SE	4	10.7	
3	63 16	1 28	ENE	5	53.3	11.0	9.5	97	Cust.	10			SE	4	10.6	
4	63 16	1 28	ENE	6	53.4	11.0	9.7	99	Cust.	10			SSW	4	10.5	
5	63 17	1 28	ENE	8	52.8	11.2	9.7	98	Cust.	10			SE	4	10.5	Swell from E$_3$.
6	63 17	1 28	ENE	9	52.5	11.2	9.7	98	Cust.	8			SE	4	10.8	
7	63 17	1 28	E$_b$N	9	52.6	11.2	9.7	98	Cust.	9			SE	4	10.8	
8	63 18	1 25	E$_b$N	9	51.7	11.1	9.7	99	Cust.	10	≡●°		E	4	10.8	Swell from SE.
9	63 18	1 24	E$_b$S	8	51.4	11.3	10.0	00	Cust.	10	≡●°		WSW	5	10.8	
10	63 18	1 23	E$_b$S	7	51 1	11.3	10.0	00	Cust.	10	≡●°		WSW	5	10.8	
11	63 17	1 22	E$_b$S	7	50.7	11.4	9.8	98	Cust.	10	≡●°		ESE	5	10.8	
12	63 17	1 21	SE	6	50.7	11.6	9.9	98	Cust.	10	≡°		ESE	4	10.7	
1p.m.	63 17	1 20	SE	6	49.9	11.4	9.8	98	Cust.	10	≡●°		ESE	3	10.7	
2	63 17	1 19	SE$_b$S	9	49.8	11.1	9.7	99	Cust.	8			SW	5	10.9	Swell from ESE$_3$.
3	63 18	1 19	SSE	8	49.2	10.9	9.7	00	Cust. Cu.	8			SW	4	11.0	
4	63 19	1 18	SSE	10	48.4	11.0	9.0	92	Cust.	7	●°		SW	4	10.8	
5	63 20	1 17	SE$_b$S	10	48.0	11.2	9.3	94	Cust.	9			SW	4	10.8	●p in SW.
6	63 21	1 16	E	14	46.6	11.3	9.5	96	Cust.	10	●		SE	4	10.8	
7	63 22	1 17	E	14	45.6	11.3	9.6	97	Cust.	10			SE	5	10.8	
8	63 24	1 19	SE	13	44.9	11.0	9.9	99	Cust.	10	●		SSE	5	10.9	
9	63 25	1 18	SE$_b$S	13	44.8	11.4	9.9	99	Cust.	10	≡●°		SSE	4	10.8	
10	63 26	1 17	SE$_b$S	11	44.5	11.3	9.9	99	Cust.	10			SSE	4	10.8	
11	63 26	1 16	SE$_b$S	10	44.5	11.4	9.3	93	Cust. Cicu.	6			S	4	10.7	
12	63 27	1 16	SE$_b$S	12	44.1	11.4	9.1	91	Cust.	9	●°		S	5	10.8	

1876. July 6.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	r	Remarks.
1a.m.	63 29	1 14 W	S$_b$E	14	743.9	11.1	9.2	94	Cust.	7			S	6	10.8	
2	63 30	1 12	S$_b$E	12	43.6	11.0	8.8	90	Cust. Cist.	3			S	6	10.8	
3	63 32	1 11	S$_b$E	15	43.0	11.0	8.8	90	Cust.	8			S	6	10.8	
4	63 34	1 9	S$_b$E	15	43.3	11.0	8.8	90	Cust.	5			S	6	10.8	
5	63 35	1 7	S$_b$E	18	42.6	11.0	9.0	92	Cust. Cu.	6	●°		S	6	10.6	⊙
6	63 37	1 5	S	19	43.0	10.8	8.6	90	Cust. Cicu.	6	●°		S	6	10.6	
7	63 39	1 3	S	19	43.3	10.4	8.7	93	Cust.	7	●°		S	7	10.4	
8	63 41	1 1	S	18	42.9	11.2	8.7	88	Cust.	8	●°		S	7	10.6	
9	63 43	0 59	S	18	42.7	11.2	8.8	89	Cust.	9	●°		S	7	10.6	⊙
10	63 45	0 57	S$_b$W	17	43.6	11.2	8.9	90	Cust.	10	●°		S	7	10.7	
11	63 47	0 55	S	19	44.4	11.2	8.9	90	Cust.	8			S	8	10.7	
12	63 49	0 54	S$_b$W	17	44.1	11.0	8.6	87	Cust. Ci.	8			S	8	10.5	
1p.m	63 49	0 55	S$_b$W	17	44.9	11.4	8.6	86	Cust.	9			S	8	10.6	
2	63 48	0 56	S	14	45.5	11.4	8.6	86	Cu. Cicu.	6			S	8	10.6	⊙
3	63 48	0 57	S	14	44.4	10.0	9.0	99	Cust.	9			S	8	10.6	●p
4	63 47	0 58	S	19	44.6	10.7	8.9	93	Cu.	6			S	8	10.4	⊙
5	63 47	0 59	S$_b$W	17	45.4	10.4	8.9	95	Cust. Cu.	6			S	8	10 2	●p
6	63 46	1 0	S$_b$W	14	45.0	10.2	9.0	97	Cust.	10	≡●°		S	8	10.2	
7	63 46	1 1	S$_b$W	13	44.6	10.4	9.2	98	Cust.	10	●		S	8	10.3	
8	63 45	1 2	SSW	13	44.7	10.5	9.2	98	Cust.	10	●		S	7	10.2	
9	63 44	1 3	SW	13	45.1	10.2	9.3	00	Cust. Cist.	8			SW	7	10.3	
10	63 44	1 4	SW	13	46.0	10.2	9.3	00	Cust.	10	≡●°		SW	7	10.4	b in W.
11	63 43	1 5	SW	13	47.0	10.2	9.0	97	Cust.	10			SW	8	10.6	
12	63 42	1 6	SW$_b$S	14	47.1	10.5	9.1	96	Cust.	10	≡●°	0.5	SW	8	10.6	

1876. July 17.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	62° 14′	4° 44′ W	W$_b$S	8	760.1	10.5	9.0	95	Cust. Cu. Str.	9			W	5	9.4	
2	62 15	4 32	WSW	8	60.3	10.3	9.1	97	Cust. Ci. Str.	5			W	5	9.3	
3	62 17	4 15	W$_b$S	8	60.2	10.7	9.0	94	Cust.	9			W	5	9.3	
4	62 19	3 59	W$_b$S	10	60.7	10.6	9.3	98	Cust.	9	●°		W	5	9.3	
5	62 21	3 43	W$_b$S	8	59.5	10.5	9.2	98	Cust.	9			W	5	9.8	● in N and NW.
6	62 23	3 26	W	9	59.5	10.0	9.2	00	Cust.	9	●°		W	5	9.6	≡
7	62 25	3 9	W	9	59.4	10.2	8.3	90	Cust.	8			W	4	9.8	
8	62 26	2 51	W	11	59.4	10.4	8.2	88	Cust.	8			W	4	10.2	
9	62 28	2 36	W	10	59.4	10.7	8.1	85	Cust.	8			W	4	10.3	
10	62 28	2 29	W$_b$N	14	59.3	10.6	8.6	91	Cust.	5			W	4	10.4	
11	62 28	2 29	W$_b$N	15	59.3	10.3	9.0	96	Cust.	9	≡°●°		W	4	10.4	
12	62 31	2 34	W	11	59.3	10.6	9.0	95	Cust.	9			W	4	10.2	
1p.m.	62 34	2 43	W$_b$N	12	60.1	10.9	9.1	94	Cust.	10	*m*		W	4	10.3	*m*
2	62 37	2 52	W$_b$N	10	59.4	10.7	9.2	97	Cust.	10	*m*		WNW	5	10.2	
3	62 40	2 59	WNW	9	60.0	10.8	9.2	95	Cust.	10	*m*		WNW	5	10.2	
4	62 43	3 10	WNW	10	60.0	10.6	9.3	98	Cust.	10	*m*		WNW	6	9.9	
5	62 47	3 19	W$_b$N	7	60.0	10.8	9.5	99	Cust.	8	*m*		WNW	6	10.2	
6	62 50	3 30	WNW	11	60.2	10.4	9.0	96	Cust.	7			W	6	10.5	
7	62 54	3 39	WNW	13	59.9	10.5	8.9	94	Cust. Cu.	3			W	6	10.5	
8	62 57	3 48	NW$_b$W	9	60.4	9.5	8.1	91	Cust. Ci.	5			W	5	10.4	
9	63 1	3 58	WNW	10	60.7	9.1	7.7	91	Cust. Ci.	9			WNW	5	10.3	
10	63 3	4 6	WNW	10	60.5	9.0	7.8	92	Cust. Ci.	7			WNW	5	10.4	
11	63 6	4 13	WNW	9	60.6	9.0	8.0	93	Cust.	7			WNW	6	10.3	
12	63 8	4 21	WNW	9	60.3	9.4	8.2	93	Cust.	8			WNW	6	10.3	

1876. July 18.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	63 10	4 30 W	W	7	759.5	9.6	8.6	96	Cust.	8			WSW	6	9.4	Confused swell.
2	63 12	4 39	W$_b$S	7	59.0	9.8	9.0	00	Cust.	9	●°		WSW	6	9.7	Confused swell.
3	63 15	4 50	W$_b$S	8	58.2	9.6	8.9	00	Cust.	9	●°		W	6	9.7	Confused swell.
4	63 17	5 1	WSW	6	57.8	9.7	9.0	00	Cust.	10	●°		W	6	9.6	Confused swell.
5	63 19	5 10	WSW	6	57.4	9.4	8.8	00	Cust.	10	●		W	5	8.6	
6	63 22	5 20	WSW	7	57.0	9.5	8.9	00	Cust.	10	●°		W	5	9.4	
7	63 22	5 29	W$_b$S	5	56.3	9.5	8.7	99	Cust.	10	●°		W	4	9.4	
8	63 22	5 29	NW$_b$W	3	56.2	9.9	9.0	99	Cust.	10			WNW	4	9.8	
9	63 22	5 29	WSW	4	55.9	10.0	8.9	98	Cust.	9			WNW	4	9.7	
10	63 22	5 29	W$_b$N	2	55.4	10.8	8.9	93	Cust.	9			WNW	4	10.2	
11	63 22	5 29		0	55.5	11.6	9.2	91	Cust.	7			WNW	3	10.4	
12	63 22	5 29	NE$_b$N	1	55.6	12.2	9.1	87	Cust.	9			W	3	10.6	
1p.m.	63 22	5 29	NE$_b$N	2	56.2	11.8	9.1	88	Cust. Cu.	9			W	3	10.7	
2	63 22	5 29	NNE	3	56.6	11.4	8.8	88	Cust. Cu.	9			W	3	10.9	
3	63 22	5 29	NNE	3	56.6	10.8	9.3	97	Cust.	10			W	2	10.7	
4	63 22	5 29	NE$_b$N	5	56.9	10.8	9.2	95	Cust.	10			NW	2	10.6	
5	63 22	5 29	N$_b$E	3	57.4	11.1	9.4	95	Cust. Cu.	9			NW	2	10.7	
6	63 22	5 29	NNE	5	58.1	10.7	9.0	94	Cust.	10			NW	2	10.5	
7	63 22	5 29	NE$_b$N	8	58.4	9.4	8.6	98	Cust.	10			NW	2	10.3	
8	63 22	5 29	NE	5	58.9	8.6	8.0	96	Cust.	10			NW	2	10.2	
9	63 22	5 29	NE	4	59.6	7.6	7.6	98	Cust.	10			NNW	2	10.3	
10	63 22	5 28	N	4	60.0	7.5	7.5	98	Cust.	10			NNW	2	10.1	Swell from W.
11	63 23	5 27	NW	3	59.6	7.5	7.4	96	Cust.	10			WSW	4	10.0	
12	63 23	5 26	N	4	60.2	7.4	7.2	94	Cust.	10		0.9	WSW	4	10.0	

1876. July 19.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	63 24	5 25 W	N$_b$W	3	760.2	7.5	7.5	98	Cust.	10			N	2	9.8	
2	63 24	5 23	N$_b$W	2	60.9	7.5	7.6	99	Cust.	10			N	2	9.9	Swell from SW. 4.
3	63 25	5 22	NW	2	61.0	7.4	7.7	00	Cust.	10			NNE	2	9.9	
4	63 25	5 21	NW	1	61.4	7.2	7.4	98	Cust.	10			NNE	2	9.9	
5	63 25	5 20	W$_b$S	2	60.9	7.0	7 3	98	Cust.	10			WSW	4	10.0	
6	63 26	5 18	SW	3	60.6	7.6	7.3	94	Cust.	9			WSW	4	10.0	
7	63 27	5 25	SSE	4	60.2	8.3	7.6	93	Cust.	9			WSW	4	10.0	
8	63 28	5 40	SSE	7	59.7	8.8	8.0	95	Cust.	10			WSW	4	10.0	
9	63 30	5 57	SE	9	59.4	9.4	8.6	98	Cust.	10	≡°		WSW	4	9.9	
10	63 32	6 15	SSE	11	59.1	9.5	8.5	96	Cust.	10	≡°●°		WSW	4	9.9	
11	63 34	6 36	SSE	12	58.1	9.4	8.7	99	Cust.	10	≡°●°		WSW	5	7.5	
12	63 36	6 53	S$_b$E	11	57.5	9.4	8.8	00	Cust.	10	≡°●°		S	5	8.5	
1p.m.	63 37	7 8	S$_b$W	13	56.4	10.0	8.4	92	Cust.	10	≡●°		SSW	5	9.2	
2	63 38	7 15	W$_b$S	12	56.5	10.2	9.0	97	Cust.	9			SSW	5	9.5	≡ in E.
3	63 38	7 27	W$_b$S	11	56.6	10.6	8.8	93	Cust.	10			SW	5	9.7	
4	63 39	7 41	SW$_b$W	10	56.5	10.8	8.9	93	Cust.	9			SW	5	9.4	
5	63 37	7 55	SSW	11	56.6	10.8	8.7	90	Cust.	4			SW	5	9.4	
6	63 34	8 8	SW$_b$W	10	56.7	10.8	8.7	90	Cust. Nim.	9			SW	4	9.8	
7	63 31	8 21	SW$_b$S	12	56.7	10.8	8.7	90	Cust. Nim.	10			SW	5	10.4	
8	63 28	8 34	SW	13	56.8	10.6	8.8	93	Cust. Nim.	8			SW	5	10.2	
9	63 27	8 40	SW$_b$W	10	56.6	10.3	8.9	95	Cust. Ci. Cist.	4	≡°●°		SW	5	10.0	
10	63 26	8 44	SW$_b$W	11	57.0	10.5	8.9	94	Cust.	10			SW	6	10.2	
11	63 25	8 50	SW$_b$W	12	57.0	10.6	8.8	93	Cust.	10	●°		SW	6	10.2	
12	63 24	8 54	SW$_b$W	15	57.0	10.4	8.8	94	Cust.	10			SW	7	10.2	

1876. July 23.

h	φ λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	E. Side of	SSW	9	751.4	10.2	8.9	96	Cust.	10	≡●°		The		10.2	
2	Heimaey,	SW	7	51.0	10.0	9.2	00	Cust.	10	≡●°		whole		10.0	
3	Vestmanøerne	WSW	7	50.6	9.8	9.0	00	Cust.	10	≡		day		9.8	
4	(Iceland);	SW	7	50.5	9.2	8.4	98	Cu.	10	≡●°		heavy		9.5	≡ at Sea.
5	at anchor.	SW	7	50.3	8.9	8.4	99	Cu.	10	●°		Sea		9.4	" " "
6	High mountains in	SW$_b$S	6	50.3	8.8	7.8	92	Cust.	10	●°		from		9.4	" " "
7	N. and W.	SW	6	50.3	8.3	8.1	99	Cust.	10			W.		9.4	" " "
8		W$_b$S	5	50.2	8.8	7.5	89	Cust.	10	●°		outside.		9.4	" " "
9		WSW	7	49.8	8.9	7.5	88	Cust.	10	≡°				9.3	
10		SW	7	49.3	9.4	7.4	86	Cust.	10					9.5	
11		SW	7	49.2	9.5	7.4	84	Cust.	10					9.4	
12		SW	7	48.9	9.2	7.6	89	Cust.	10	≡°●°				9.6	
1p.m.		SW$_b$W	9	48.7	10.1	6.8	74	Cu.	4					10.2	
2		W$_b$S	9	48.2	10.8	6.5	68	Cust.	4					10.4	
3		SW	9	48.0	10.4	6.6	71	Cust.	8					10.3	*q* the whole afternoon.
4		W	10	48.0	9.4	6.9	79	Cust.	10					10.2	
5		W	10	47.9	9.2	6.6	76	Cust.	10	●°				10.0	
6		SW$_b$W	11	47.9	9.3	7.6	88	Cust.	10					9.6	
7		WSW	10	47.9	9.2	6.9	80	Cust.	10					9.5	
8		W	8	47.9	9.2	6.5	75	Cust.	8					9.6	
9		W$_b$S	12	48.2	9.4	6.0	69	Cust.	10					9.5	
10		WSW	11	48.4	9.2	6.2	71	Cust.	7	●°				9.3	
11		WSW	11	48.5	9.1	6.6	76	Cust.	8					9.3	
12		WSW	12	48.4	9.2	6.5	75	Cust.	9		0.9			9.3	

1876. July 24.

h	φ λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	E. side of	WSW	11	748.5	9.2	7.1	81	Cust.	3			Con-		9.5	Violent squalls of wind the whole day.
2	Heimaey,	SW	12	48.3	9.0	7.0	81	Cust.	4			fused		9.4	The main land (Iceland) invisible.
3	Vestmanøerne	WSW	12	48.2	9.2	6.7	78	Cust.	5			Sea to		9.4	
4	(Iceland);	SW	14	48.1	9.1	6.5	75	Cust.	4			leward		9.4	
5	High mountains in	SW	17	47.9	9.3	6.8	78	Cu.	3			of the		9.3	
6	N. and W.	SW	19	47.9	9.4	6.7	76	Cust.	8			Island.		9.3	
7		SW$_b$S	17	48.2	9.5	7.3	83	Cu.	3					9.2	
8		SW$_b$S	19	47.7	10.0	7.1	78	Cu.	3					9.5	
9		SW	18	48.0	10.4	7.1	75	Cust.	4					9.6	
10		W$_b$S	17	48.7	10.4	6.9	74	Cust.	6					9.6	
11		SW$_b$S	14	48.5	10.3	6.8	73	Cust.	4					9.5	
12		SW$_b$W	16	49.0	10.8	6.9	71	Cust.	7					9.5	
1p.m.		SW$_b$W	15	49.0	10.8	8.4	89	Cust.	8					9.5	
2		SW	18	49.1	10.7	7.2	74	Cust.	7					9.6	
3		SW	16	49.2	10.8	7.3	75	Cust.	6					9.5	
4		SW	15	49.6	10.8	7.4	76	Cust.	8					9.8	
5		SW	18	49.4	10.2	7.4	79	Cust.	10					9.5	
6		SW	15	49.8	10.0	7.1	78	Cust.	10	≡°				9.8	
7		WSW	15	49.7	9.9	7.0	78	Cust.	10	≡°				9.9	
8		WSW	11	49.8	9.6	7.2	82	Cnst.	9	≡°				9.8	
9		WSW	15	49.0	9.6	7.2	82	Cust.	9	*m*				9.8	
10		SW	13	48.8	9.5	6.8	76	Cust.	5	*m*				9.6	
11		SW$_b$S	11	47.9	9.6	6.8	76	Cust.	7	*m*				9.5	
12		SW$_b$W	10	47.0	9.6	6.8	76	Cust.	7	*m*	0.0			9.4	

1876. July 25.

h	φ λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	E. Side of	SW	14	746.8	9.2	6.6	76	Cust.	9	●°				9.8	
2	Heimaey.	SW$_b$W	16	45.9	9.2	6.6	76	Cust.	9					9.8	
3	Vestmanøerne	SW	11	45.8	9.1	6.6	76	Cust.	9					9.9	
4	(Iceland);	SW$_b$S	11	45.5	8.8	6.2	73	Cust.	9	●°				9.8	
5	High mountains in	SW$_b$S	5	44.8	8.2	7.2	89	Cust.	10	●°				9.8	
6	N. and W.	SW$_b$W	6	44.4	8.5	7.0	86	Cust.	8					9.8	
7		SW	11	44.7	9.0	6.7	78	Cust.	9					10.2	
8		WSW	10	45.1	9.0	6.7	78	Cust.	8					10.3	
9		WSW	9	45.0	9.2	7.2	83	Cust.	8					9.9	
10		W	9	45.4	9.0	6.5	76	Cust.	9					9.8	
11		SW	8	45.6	9.2	7.3	84	Cust.	10					9.8	
12		SW	7	45.6	9.4	6.6	75	Cust.	10	●°				10.0	
1p.m.		SW$_b$S	6	46.0	10.2	6.8	73	Cust.	8					10.2	
2		SW$_b$W	9	46.4	10.7	7.1	73	Cust.	3					10.2	
3		SW$_b$W	10	46.8	10.6	8.1	85	Cust. Ci.	3					10.4	
4		SW	10	46.9	10.8	7.5	77	Cust. Cu.	4					10.4	
5		SSW	8	47.4	10.6	6.8	72	Cust.	4					10.4	
6		NE	5	47.8	10.6	6.6	70	Cust.	4					10.4	
7		N	7	48.1	10.2	6.2	67	Cust.	3					10.2	
8		N$_b$E	3	48.7	10.3	6.5	65	Cust.	4					10.2	
9		NNW	9	49.8	9.7	6.1	68	Cu.	2					10.0	Direction of wind on the Sea estimated.
10		N$_b$W	9	50.1	9.3	5.8	66	Cu.	2					9.4	
11		N$_b$W	8	50.3	9.2	5.9	68	Cu.	1					9.5	
12		NNW	6	50.6	9.0	5.4	74	Cu.	1		0.0			9.9	

1876. July 4.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	63° 4′	1° 18′ W	SSE	10	756.6	11.0	9.0	92	Cust.	8			SW	5	10.8	
2	63 4	1 19	SEbE	10	55.9	11.0	9.0	92	Cust.	9			SW	4	10.8	Swell from E.
3	63 5	1 20	ESE	9	55.5	11.1	9.1	93	Cust.	9			SW	4	10.6	Swell from E.
4	63 5	1 21	EbS	10	55.1	11.1	9.2	94	Cust. Nim.	9			SW	4	10.6	●p in SW.
5	63 6	1 22	SE	11	55.5	11.1	9.4	95	Cust.	10	●		S	4	10.6	
6	63 6	1 24	SEbS	6	56.8	10.6	9.3	98	Cust.	10	●		S	4	10.4	
7	63 7	1 26	ESE	6	54.4	10.6	9.3	98	Cust.	10	●		S	4	10.4	
8	63 7	1 26	ESE	11	54.2	10.5	8.9	94	Cust.	10	●		S	4	10.4	
9	63 8	1 26	EbS	12	53.7	10.4	9.2	98	Cust.	10	●		ESE	4	10.5	
10	63 8	1 26	EbS	11	53.6	10.8	9.4	98	Cust.	10	●		SE	4	10.8	
11	63 9	1 27	EbS	9	53.7	10.8	9.5	99	Cust.	10	●		SE	4	11.0	
12	63 9	1 26	EbS	13	53.7	10.4	9.4	00	Cust.	10	●		SE	4	10.8	
1p.m.	63 10	1 26	E	12	53.7	10.6	9.3	98	Cust.	10	●		S	4	10.8	Confused Swell.
2	63 10	1 26	E	8	53.4	10.8	9.4	98	Cust.	10	●		SE	5	10.8	
3	63 11	1 26	E	12	53.6	10.8	9.5	99	Cust.	10			SE	5	10.6	
4	63 11	1 26	EbS	9	53.6	11.1	9.7	99	Cust.	10			SE	6	10.6	
5	63 12	1 26	EbS	12	53.6	10.8	9.2	95	Cust.	10	●		SE	6	10.5	
6	63 12	1 26	ESE	12	53.6	10.6	9.0	95	Cust.	10	●		SE	6	10.4	
7	63 13	1 26	ESE	11	53.6	10.4	9.4	00	Cust.	10	≡●		SE	6	10.5	Swell from SE, less swell from ESE for
8	63 13	1 27	ESE	11	53.6	10.4	9.4	00	Cust.	10	≡●°		SE	6	10.5	Wind.
9	63 14	1 27	ESE	13	53.3	10.4	9.4	00	Cust.	10	≡●°		SE	5	10.5	
10	63 14	1 27	SEbE	10	53.3	10.4	9.4	00	Cust.	10	≡●°		SE	5	10.5	
11	63 15	1 27	SEbE	10	53.6	10.5	9.5	00	Cust.	10		6.0	SE	5	10.7	
12	63 15	1 27	ESE	9	53.5	10.6	9.5	00	Cust.	10			SE	5	10.7	

1876. July 5.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	63 15	1 27 W	ENE	8	753.8	10.8	9.4	98	Cust.	10			SE	5	10.7	
2	63 16	1 28	ENE	8	53.7	10.7	9.5	99	Cust.	10			SE	4	10.7	
3	63 16	1 28	ENE	5	53.3	11.0	9.5	97	Cust.	10			SE	4	10.6	
4	63 16	1 28	ENE	6	53.4	11.0	9.7	99	Cust.	10			SSW	4	10.5	
5	63 17	1 28	ENE	8	52.8	11.2	9.7	98	Cust.	10			SE	4	10.5	Swell from E_3.
6	63 17	1 28	ENE	9	52.5	11.2	9.7	98	Cust.	8			SE	4	10.8	
7	63 17	1 28	EbN	9	52.6	11.2	9.7	98	Cust.	9			SE	4	10.8	
8	63 18	1 25	EbN	9	51.7	11.1	9.7	99	Cust.	10	≡●°		E	4	10.8	Swell from SE.
9	63 18	1 24	EbS	8	51.4	11.3	10.0	00	Cust.	10	≡●°		WSW	5	10.8	
10	63 18	1 23	EbS	7	51.1	11.3	10.0	00	Cust.	10	≡●°		WSW	5	10.8	
11	63 17	1 22	EbS	7	50.7	11.4	9.8	98	Cust.	10	≡●°		ESE	5	10.8	
12	63 17	1 21	SE	6	50.7	11.6	9.9	98	Cust.	10	≡°		ESE	4	10.7	
1p.m.	63 17	1 20	SE	6	49.9	11.4	9.8	98	Cust.	10	≡●°		ESE	3	10.7	
2	63 17	1 19	SEbS	9	49.8	11.1	9.7	99	Cust.	8			SW	5	10.9	Swell from ESE_3.
3	63 18	1 19	SSE	8	49.2	10.9	9.7	00	Cust. Cu.	8			SW	4	11.0	
4	63 19	1 18	SSE	10	48.4	11.0	9.0	92	Cust.	7	●°		SW	4	10.8	
5	63 20	1 17	SEbS	10	48.0	11.2	9.3	94	Cust.	9			SW	4	10.8	●p in SW.
6	63 21	1 16	E	14	46.6	11.3	9.5	96	Cust.	10	●		SE	4	10.8	
7	63 22	1 17	E	14	45.6	11.3	9.6	97	Cust.	10			SE	5	10.8	
8	63 24	1 19	SE	13	44.9	11.0	9.9	99	Cust.	10	●		SSE	5	10.9	
9	63 25	1 18	SEbS	13	44.8	11.4	9.9	99	Cust.	10	≡●°		SSE	4	10.8	
10	63 26	1 17	SEbS	11	44.5	11.3	9.9	99	Cust.	10			SSE	4	10.8	
11	63 26	1 16	SEbS	10	44.5	11.4	9.3	93	Cust. Cicu.	6			S	4	10.7	
12	63 27	1 16	SEbS	12	44.1	11.4	9.1	91	Cust.	9	●°		S	5	10.8	

1876. July 6.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	63 29	1 14 W	SbE	14	743.9	11.1	9.2	94	Cust.	7			S	6	10.8	
2	63 30	1 12	SbE	12	43.6	11.0	8.8	90	Cust. Cist.	3			S	6	10.8	
3	63 32	1 11	SbE	15	43.0	11.0	8.8	90	Cust.	8			S	6	10.8	
4	63 34	1 9	SbE	15	43.3	11.0	8.8	90	Cust.	5			S	6	10.8	
5	63 35	1 7	SbE	18	42.6	11.0	9.0	92	Cust. Cu.	6	●°		S	6	10.6	⊙
6	63 37	1 5	S	19	43.0	10.8	8.6	90	Cust. Cicu.	6	●°		S	6	10.6	
7	63 39	1 3	S	19	43.3	10.4	8.7	93	Cust.	7	●°		S	7	10.4	
8	63 41	1 1	S	18	42.9	11.2	8.7	88	Cust.	8	●°		S	7	10.6	
9	63 43	0 59	S	18	42.7	11.2	8.8	89	Cust.	9	●°		S	7	10.6	⊙
10	63 45	0 57	SbW	17	43.6	11.2	8.9	90	Cust.	10	●°		S	7	10.7	
11	63 47	0 55	S	19	44.4	11.2	8.9	90	Cust.	8			S	8	10.7	
12	63 49	0 54	SbW	17	44.1	11.0	8.6	87	Cust. Ci.	8			S	8	10.5	
1p.m	63 49	0 55	SbW	17	44.9	11.4	8.6	86	Cust.	9			S	8	10.6	
2	63 48	0 56	S	14	45.5	11.4	8.6	86	Cu. Cicu.	6			S	8	10.6	⊙
3	63 48	0 57	S	14	44.4	10.0	9.0	99	Cust.	9			S	8	10.6	●p
4	63 47	0 58	S	19	44.6	10.7	8.9	93	Cu.	6			S	8	10.4	⊙
5	63 47	0 59	SbW	17	45.4	10.4	8.9	95	Cust. Cu.	6			S	8	10.2	●p
6	63 46	1 0	SbW	14	45.0	10.2	9.0	97	Cust.	10	≡●°		S	8	10.2	
7	63 46	1 1	SbW	13	44.6	10.4	9.2	98	Cust.	10	●		S	8	10.3	
8	63 45	1 2	SSW	13	44.7	10.5	9.2	98	Cust.	10	●		S	7	10.2	
9	63 44	1 3	SW	13	45.1	10.2	9.3	00	Cust. Cist.	8			SW	7	10.3	
10	63 44	1 4	SW	13	46.0	10.2	9.3	00	Cust.	10	≡●°		SW	7	10.4	b in W.
11	63 43	1 5	SW	13	47.0	10.2	9.0	97	Cust.	10			SW	8	10.6	
12	63 42	1 6	SWbS	14	47.1	10.5	9.1	96	Cust.	10	≡●°	0.5	SW	8	10.6	

1876. August 12.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1 a.m.	64° 51′	2° 36′ E	SW	13	755.8	11.2	9.2	93	Cust.	10	●°		SW	6	10.5	
2	64 50	2 35	SW	13	55.8	11.2	9.0	92	Cust.	10			SW	6	10.5	
3	64 49	2 51	SW	12	56.0	11.2	9.2	93	Cust.	10			SW	6	10.8	
4	64 49	3 10	SW	12	56.5	11.2	9.7	98	Cust.	10			SW	6	10.8	
5	64 49	3 30	SW	13	56.7	11.4	10.1	00	Cust.	10			SW	6	10.8	
6	64 48	3 50	SW	12	56.9	11.7	10.1	99	Cust.	10			SW	6	11.0	
7	64 48	4 9	SW	12	57.1	11.6	10.2	00	Cust.	10			SW	6	11.0	
8	64 47	4 24	SW	13	57.7	11.8	10.3	00	Cust.	10	●°		SW	6	11.0	
9	64 47	4 24	SWbS	16	57.7	11.8	10.3	00	Cust.	10	≡°●°		SW	6	11.0	
10	64 47	4 24	SWbS	17	58.1	12.0	10.5	00	Cust.	10	≡°●°		SW	6	11.1	
11	64 47	4 24	SW	17	58.1	12.1	10.4	99	Cust.	10	≡●°		SW	7	11.2	
12	64 47	4 24	SWbS	15	58.0	12.1	10.4	99	Cust.	10	≡●°		SW	7	11.4	
1 p.m.	64 47	4 24	SWbS	14	58.2	12.1	10.4	99	Cust.	10	≡●°		SW	7	11.2	
2	64 47	4 24	SW	15	58.5	12.1	10.4	99	Cust.	10	≡●°		SW	7	11.0	
3	64 47	4 24	SWbS	15	58.4	11.9	10.3	99	Cust.	10	≡●°		SW	7	11.0	
4	64 47	4 26	SbW	11	58.1	11.8	10.2	99	Cust.	10	≡°		SW	7	10.9	
5	64 48	4 36	SW	13	58.3	11.7	10.1	99	Cust.	10	≡		SW	7	10.9	
6	64 49	4 46	SW	12	58.7	11.6	10.2	00	Cust.	10	≡●°		SW	7	10.8	
7	64 49	4 56	SWbS	12	58.2	11.6	10.2	00	Cust.	10	≡		SW	7	11.0	
8	64 48	5 6	SW	13	58.5	11.5	10.1	00	Cust.	10	≡●°		SW	7	11.0	
9	64 47	5 22	SW	16	59.6	11.6	10.2	00	Cust.	10	≡●°		SW	7	11.2	
10	64 46	5 38	SW	15	59.5	11.5	10.1	00	Cust.	10	≡●°		SW	7	11.2	
11	64 45	5 54	SW	16	59.4	11.2	9.9	00	Cust.	10	≡●°		SW	7	11.0	
12	64 44	6 9	SW	15	59.3	11.2	9.9	00	Cust.	10	≡●°		SW	7	11.0	
1876. August 13.																
1 a.m.	64 43	6 28 E	SW	13	759.1	11.2	9.9	00	Cust.	10	≡●°		SW	7	10.8	
2	64 42	6 47	SW	13	59.5	11.0	9.8	00	Cust.	10			SW	6	10.6	
3	64 41	7 6	SWbW	13	59.6	11.0	9.8	00	Cust.	10			SW	6	10.5	
4	64 40	7 24	SWbW	11	59.7	11.0	9.8	00	Cust.	10			SW	6	10.6	
5	64 38	7 42	SWbW	13	59.6	11.0	9.8	00	Cust.	10	≡●°		SW	6	10.6	
6	64 37	8 0	SWbW	14	60.0	10.8	9.6	00	Cust.	10	≡●°		SW	6	10.8	
7	64 32	8 19	WSW	15	60.3	11.0	9.8	00	Cust.	10	≡●°		WSW	6	10.8	
8	64 28	8 38	WSW	17	60.7	11.0	9.8	00	Cust.	10	≡●°		WSW	6	10.5	
9	64 27	8 37	SSW	8	60.8	11.0	9.8	00	Cust.	10	≡●°		SSW	6	10.5	
10	64 27	8 36	SSW	13	61.0	11.1	9.9	00	Cust.	10	≡●°		SSW	6	10.5	
11	64 23	8 52	WSW	12	60.9	11.2	9.9	00	Cust.	10	≡●°		WSW	6	10.6	
12	64 23	8 51	SWbW	12	61.8	11.2	9.8	99	Cust.	10	≡●°		SW	6	11.0	
1 p.m.	64 21	8 49	SWbW	14	61.8	11.0	9.8	00	Cust.	10	≡●°		SW	6	10.9	⊙
2	64 21	8 47	SWbW	8	61.8	11.3	10.0	00	Cust.	10	≡●°		SW	6	11.0	⊙
3	64 20	8 43	SWbW	9	61.8	11.0	9.8	00	Cust.	10	≡●°		SW	5	11.0	⊙
4	64 21	8 49	W	10	62.1	10.3	8.7	94	Cust. Str.	8	≡●°		W	5	10.8	
5	64 18	9 3	WSW	9	62.2	10.6	8.6	91	Cust.	10	●		WSW	5	10.8	
6	64 14	9 17	WSW	9	62.4	10.5	8.9	94	Cust.	10			WSW	5	10.4	
7	64 12	9 31	WSW	9	62.8	10.5	9.1	96	Cust.	10	●		WSW	2	11.2	
8	Halten.		WbS	9	63.4	10.4	8.9	95	Cust.	10	●				11.1	
9			WbN	9	63.7	10.4	8.7	93	Cust.	10	●°				11.0	
10			WbN	5	64.0	10.0	8.7	95	Cust.	10					10.8	
11			WbN	8	64.1	9.6	8.2	92	Cust.	10	●°				10.7	
12			WbN	5	63.8	10.0	7.7	84	Cust.	10		2.0			11.2	
1876. August 21.																
1 a.m.	64 41	9 10 E	ENE	7	762.3	12.6	10.1	93	Str.	1			NE	1	11.6	
2	64 41	9 0	E	8	61.0	12.6	10.3	96	Str.	1			NE	1	11.6	
3	64 42	8 48	E	8	60.5	12.5	10.4	97	Str.	1			NE	1	11.5	
4	64 43	8 31	E	8	60.0	12.3	10.5	99	Str.	1			NE	1	11.5	
5	64 44	8 19	ENE	4	59.7	12.2	10.5	99	Str.	2	⌂		NE	1	11.5	≡ in S.
6	64 44	8 9	SEbS	4	59.4	12.2	10.6	00	Str.	1	⌂		NE	1	11.6	
7	64 45	8 2	SSW	4	59.1	12.2	10.3	98	Cu.	1			NE	1	11.5	*m* horiz.
8	64 45	7 53	SbW	4	59.0	12.2	10.3	98	Cu.	1				0	11.6	
9	64 46	7 38	SSW	9	58.9	12.5	10.4	97	Ci. Str.	1	≡		NE	1	11.7	
10	64 46	7 28	SW	8	59.0	11.0	9.4	93	Ci. Cust.	8			SW	2	11.3	
11	64 47	7 17	SW	11	58.6	11.6	9.7	96	Cust.	10			SW	2	11.3	
12	64 47	7 12	SW	11	58.5	11.4	9.3	93	Cust.	10			SW	2	11.2	
1 p.m.	64 47	6 56	SWbS	12	58.2	11.0	9.5	97	Cust.	10			SW	2	11.2	
2	64 48	6 45	SWbS	8	57.8	11.0	9.5	97	Cust.	10			SW	2	11.5	
3	64 48	6 40	SWbS	8	57.5	11.0	9.5	97	Cust.	10			SW	2	11.4	
4	64 48	6 32	SbW	7	57.1	10.7	9.5	99	Cust.	10			SW	2	11.6	
5	64 48	6 32	SWbW	6	56.9	10.6	9.5	00	Cust.	10	≡		SW	2	11.6	
6	64 48	6 26	SW	5	56.7	10.6	9.5	00	Cust.	10	≡		SW	2	11.6	
7	64 49	6 16	WSW	3	56.5	10.2	9.3	00	Cust.	10	≡		WSW	1	11.6	
8	64 49	6 3	S	5	56.6	10.2	9.2	99	Cust.	10	≡		SW	1	11.4	
9	64 50	5 53	SbE	6	55.5	10.4	9.4	00	Cust.	10	≡		SW	1	11.2	
10	64 50	5 39	SSW	5	55.5	10.2	9.3	00	Cust.	10	≡		SW	1	11.3	
11	64 50	5 32	SbE	6	55.4	10.4	9.4	00	Cust.	10	≡°●°		SW	1	11.3	
12	64 47	5 30	SSE	6	55.2	11.3	9.9	99	Cust.	8			SW	1	11.3	

1876. August 6.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1a.m.	63° 51′	12° 5′ W	S	9	753.0	10.4	9.2	98	Cust.	10	≡°●°		SSW	3	10.2	
2	63 57	11 52	SSW	10	52.8	10.2	9.3	00	Cust.	10	≡°●°		SW	3	10.2	
3	64 2	11 40	S	10	52.7	10.1	9.1	99	Cust.	10	≡°●°		SW	3	9.7	
4	64 7	11 27	S	11	52.2	10.1	9.1	99	Cust.	10	≡°●°		SW	3	9.6	
5	64 13	11 16	S	9	52.3	10.0	8.9	98	Cust.	10	≡°●°		SW	3	9.6	
6	64 14	11 12	SSW	8	52.2	10.1	8.7	95	Cust.	9			SSW	3	9.5	
7	64 20	11 0	S	9	52.5	10.0	8.4	92	Cust.	9			SSW	3	9.8	
8	64 26	10 47	S	9	52.9	10.3	8.4	90	Cust.	10			SSW	3	9.5	
9	64 31	10 35	S	10	52.4	7.9	7.4	93	Cust.	10	≡°		SSW	3	4.8	
10	64 36	10 22	S_bW	8	52.4	8.0	7.8	98	Cust.	10			SSW	3	5.3	
11	64 36	10 22	SE	6	51.8	8.4	7.8	94	Cust.	10	≡°		SSW	3	6.4	⊙
12	64 36	10 22	SE	8	51.6	8.0	7.7	96	Cust.	10	≡°●°	0.3	S	3	5.5	
1p.m.	64 36	10 22	SE_bE	9	50.8	8.0	7.8	98	Cust.	10	≡●°		S	3	5.3	
2	64 36	10 22	SE	8	49.8	8.2	6.8	83	Cust.	10	≡		S	4	6.6	
3	64 36	10 22	SE	6	49.3	7.8	7.6	96	Cust.	10	≡		S	4	6.2	
4	64 36	10 22	SE	7	48.9	7.8	7.7	98	Cust.	10	≡		S	4	6.2	
5	64 38	10 17	S_bW	2	47.9	7 9	7.9	99	Cust.	10	≡●°		SSE	3	6.7	
6	64 44	10 4	S	2	47.6	8.4	8.0	97	Cust.	10	≡●°		SSE	4	7.0	
7	64 49	9 51	SSE	2	47.0	8.0	8.0	00	Cust.	10	≡●°		SSE	4	7.2	
8	64 54	9 39	E_bS	10	46.5	8.0	8.0	00	Cust.	10	≡●°		SSE	4	6.8	
9	64 59	9 26	SE_bE	14	45.7	8.4	8.2	00	Cust.	10	≡●°		SSE	4	6.8	
10	65 0	9 24	ESE	13	45.4	8.4	8.2	00	Cust.	10	≡●°		SSE	4	7.4	
11	65 6	9 12	SE	12	45.0	8.3	8.2	00	Cust.	10	≡●°		SW	4	7.8	
12	65 11	9 0	SE_bS	11	44.5	8.2	8.1	00	Cust.	10	≡●°		SW	4	8.0	

1876. August 7.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1a.m.	65 16	8 48 W	SSE	7	744.8	8.0	8.0	00	Cust.	10	≡●°		SE	5	7.5	
2	65 21	8 36	S	8	44.6	8.0	8.0	00	Cust.	10	≡●°		SE	5	7.8	
3	65 26	8 23	S_bE	5	44.8	8.0	8.0	00	Cust.	10	≡●°		SE	4	7.8	
4	65 28	8 19	S	7	44.8	8.0	8.0	00	Cust.	10	≡●°		SE	5	7.8	
5	65 33	8 6	SSE	8	45.1	8.0	8.0	00	Cust.	10	≡●°		SE	5	7.4	
6	65 39	7 53	S_bE	6	45.5	8.1	8.1	00	Cust.	10	≡●°		SE	5	7.2	
7	65 44	7 40	S_bE	9	45.8	8.2	8.1	00	Cust.	10	≡		SE	5	8.3	
8	65 49	7 27	S_bE	9	45.9	8.4	8.2	00	Cust.	10	≡	1.8	SE	5	8.0	
9	65 53	7 18	SE_bS	8	45.5	8.9	8.5	00	Cust.	10	≡●°		SE	5	8.0	
10	65 53	7 18	SE_bE	9	45 4	8.8	8.5	00	Cust.	10	≡●°		SE	4	8.0	
11	64 53	7 18	ESE	9	45.3	9.0	8.4	99	Cust.	10	≡		SE	4	7.8	
12	65 53	7 18	SE	8	45.6	8.8	8.3	99	Cust.	10	≡		SE	4	7.9	
1p.m.	65 53	7 18	SE	8	45.3	8.6	8.3	00	Cust.	10	≡		SE	3	7.9	
2	65 53	7 18	SSE	8	45.4	8.8	8.5	00	Cust.	10	≡		SE	4	7.8	
3	65 53	7 18	S_bE	6	45.4	8.6	8.3	00	Cust.	10	≡●°		SE	4	8.0	
4	65 53	7 18	S	10	45.4	8.6	8.3	00	Cust.	10	≡●°		SE	4	8.0	
5	65 53	7 18	S	9	45.1	8.6	8.3	00	Cust.	10	≡●°		SE	4	8.0	
6	65 53	7 18	SE_bS	10	45.2	8.5	8.3	00	Cust.	10	≡●°		SE	4	8.0	
7	65 53	7 18	SE_bS	9	45.6	8.5	8.3	00	Cust.	10	≡●°		SE	4	8.0	
8	65 53	7 18	SE_bS	8	45.9	8.3	8.2	00	Cust. Cu.	10	≡		SE	4	8.0	
9	65 53	7 17	S	6	46.5	8.2	8.1	00	Cust.	10	≡		SE	4	8.1	
10	65 52	6 58	S_bW	7	46.8	8.2	8.1	00	Cust.	10			SSE	4	8.4	
11	65 52	6 39	SW_bS	6	47.3	8.6	8.2	99	Cust.	10			SSE	4	8.5	
12	65 51	6 19	SSW	8	47.6	8.6	8.2	99	Cust.	10	≡		SSE	4	8.7	

1876. August 8.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1a.m.	65 51	5 58 W	SW_bS	9	747.2	8.8	8.5	00		10	≡		S	4	8.5	
2	65 51	5 36	SW_bS	8	48.7	8.8	8.5	00		10	≡●°		S	5	8.4	
3	65 50	5 12	SW_bS	9	49.4	8.9	8.5	00		10	≡●°		S	5	9.1	
4	65 49	4 50	SW_bS	10	49.5	9.0	8.6	00		10	≡●°		S	5	9.0	
5	65 49	4 30	SW_bS	9	50.6	9.0	8.6	00	Cust.	10			SSW	3	9.2	
6	65 49	4 8	SW_bS	8	50.3	9.0	8.6	00	Cust.	10			SSW	3	9.3	
7	65 49	3 47	S_bW	8	51.8	9.2	8.4	98	Cust.	10			SSW	4	9.1	
8	65 48	3 28	SW_bS	9	52.3	9.2	8.4	98	Cust.	10			SSW	4	9.3	
9	65 48	3 9	SW	10	53.1	9.9	8.5	94	Cust.	10	≡°		SSW	3	9.8	
10	65 48	3 7	SW_bS	9	53.5	10.3	8.1	88	Cust.	10			SSW	4	9.8	
11	65 48	3 7	SW_bS	10	53.8	10.4	8.0	85	Cust.	10			SSW	4	9.7	
12	65 48	3 7	SSW	7	53.9	10.2	7.8	84	Cust.	10			SSW	4	9.8	
1p.m	65 48	3 7	SSE	10	54.2	10.6	8.2	87	Cust.	10			SSW	5	10.0	
2	65 48	3 7	S_bE	9	53.7	10.7	8.3	87	Cust.	10			SW	5	10.2	
3	65 48	3 7	SSE	7	53.5	10.2	8.3	90	Cust.	10			SW	5	10.2	
4	65 48	3 7	SE_bE	11	53.2	10.3	8.5	92	Cust.	10			SSE	5	10.3	
5	65 48	3 7	SE	11	52.9	10.1	8.6	94	Cust.	10			S	5	10.2	
6	65 48	3 7	SE_bS	11	52.1	10.0	8.8	96	Cust.	10	●		S	5	10.2	
7	65 48	3 7	SE_bS	12	51.1	10.0	8.9	98	Cust.	10	●		S	4	10.2	
8	65 48	3 7	SE_bS	15	50.3	10.0	8.9	98	Cust.	10	●		SSE	4	10.2	
9	65 48	3 7	SE_bE	18	48.8	10.4	9.2	98	Cust.	10	●		SSE	5	10.2	
10	65 46	3 3	SE	19	48.2	10.4	9.4	00	Cust.	10	●		SSE	6	10.2	
11	65 43	3 1	SE	12	47.6	10.5	9.5	00	Cust.	10	●		SSE	6	10.0	
12	65 40	2 59	SE_bS	11	47.3	10.5	9.5	00	Cust.	10	●°		SSE	6	10.0	

1876. August 9.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	65° 37′	2° 50′ W	S$_b$W	12	747.5	10.6	9.3	98	Cust.	10	●°		SSE	5	10.0	
2	65 34	2 41	S	10	47.9	10.4	9.3	99	Cust.	10			S	5	10.1	
3	65 31	2 31	S	11	48.2	10.4	8.9	95	Cust.	9			SSW	6	10.1	
4	65 30	2 16	SSW	10	48.3	10.1	9.0	98	Cust.	9			SSW	6	9.8	
5	65 28	2 3	SSW	12	49.4	10.1	8.9	96	Cust.	10	≡●°		SSW	5	10.0	
6	65 27	1 48	SW$_b$S	11	50.1	9.8	8.9	99	Cust.	10	≡●°		SSW	5	10.2	
7	65 25	1 30	SSW	12	50.2	10.0	8.8	96	Cust.	10	≡°		SSW	5	10.2	
8	65 24	1 14	SSE	11	50.9	9.8	8.6	95	Cust.	10	≡°		SSW	6	10.0	
9	65 23	0 55	SSE	8	50.9	10.2	9.0	97	Cust.	10			SSW	6	10.6	
10	65 22	0 38	SSE	9	50.7	10.8	9.2	95	Cust.	10	●°		SSW	6	10.7	
11	65 21	0 20	SSE	11	50.5	11.3	9.7	98	Cust.	10	●°		SSW	6	10.5	
12	65 20	0 4 W	S$_b$E	12	50.5	11.5	10.0	99	Cust.	10	≡°●°		S	6	10.6	
1p.m.	65 19	0 12 E	S$_b$E	12	50.4	11.7	10.0	98	Cust.	10	≡°●°		S	6	10.7	
2	65 17	0 15	SSE	14	50.7	11.7	10.1	99	Cust.	10	●		S	6	10.7	
3	65 16	0 18	SSE	13	50.2	12.0	10.2	98	Cust.	10	●		SSE	6	10.5	
4	65 14	0 18	S$_b$E	14	49.4	11.8	9.8	96	Cust.	10	●		SSE	6	10.7	
5	65 12	0 18	SSE	14	49.4	11.7	10.0	98	Cust.	10	●		SSW	6	10.6	
6	65 10	0 18	S$_b$E	15	49.6	11.8	10.1	98	Cust.	10			SSW	6	10.7	
7	65 8	0 17	S	13	49.5	11.8	10.0	97	Cust.	10	≡	6.1	SSW	6	10.9	
8	65 6	0 17	S	13	49.6	11.6	9.4	94	Cust.	10			S	6	11.0	
9	65 4	0 17	S	10	49.6	11.0	8.8	90	Cust.	10			S	6	10.8	
10	65 2	0 17	SE$_b$S	14	49.7	10.6	8.2	87	Cust.	10			S	6	10.5	
11	65 0	0 16	SE	11	49.8	10.4	7.7	82	Cust.	10	●°		S	6	10.4	
12	64 58	0 15	SE	10	49.9	10.2	8.3	90	Cust.	10	●°		SSW	6	10.4	

1876. August 10.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	64 55	0 13 E	SSW	10	750.6	10.0	8.2	89	Cust.	10	●		SSW	5	10.4	
2	64 53	0 10	SSW	11	50.5	9.7	7.8	87	Cust.	9	●°		SSW	5	10.4	
3	64 50	0 7	SSW	10	50.5	9.5	7.8	88	Cu. Cust.	6			SSW	5	9.4	
4	64 48	0 4	SSW	9	50.8	10.0	7.6	83	Cu. Cust.	5			SSW	5	9.7	
5	64 45	0 1	SW$_b$S	8	51.3	10.2	8.1	87	Cu.	4			SSW	5	10.0	
6	64 51	0 8	SW$_b$W	9	51.8	10.6	7.8	83	Cu.	4			SW	5	10.6	
7	64 57	0 14	SW	8	52.0	10.8	7.7	81	Cu.	4			SW	5	10.6	
8	65 3	0 20	SW	8	52.1	10.4	7.3	76	Cu.	4			SW	4	10.5	
9	65 8	0 26	SW$_b$S	7	52.7	10.6	7.4	77	Cu.	7			SW	4	10.6	
10	65 14	0 33	SSW	11	53.8	11.2	8.0	80	Cu.	4			SSW	4	10.5	
11	65 14	0 33	SSW	13	53.3	11.2	8.0	80	Cu. Ci. Cist.	4			SSW	4	10.4	
12	65 14	0 33	SSW	13	53.6	11.2	8.0	80	Cu. Cist.	9		0.2	SSW	5	10.4	
1p m.	65 14	0 33	SSW	12	53.8	10.8	8.0	83	Cust.	10			SSW	5	10.4	
2	65 14	0 33	S$_b$W	12	53.7	11.0	8.3	85	Cust.	10	●°		S	5	10.4	
3	65 14	0 33	SSW	10	53.7	11.6	8.6	85	Cust. Ci.	7			SSW	5	10.8	
4	65 14	0 33	S$_b$W	10	53.7	11.0	8.6	87	Cust. Ci.	5			S	5	10.6	
5	65 14	0 33	SW$_b$S	13	52.5	10.8	8.7	90	Cust. Ci.	7			SW	5	10.7	
6	65 14	0 33	S$_b$W	17	52.5	10.8	8.4	89	Cust.	9			SSW	6	10.5	
7	65 14	0 33	SW$_b$S	16	52.4	10.0	8.9	98	Cust.	10	●°		SW	6	10.5	
8	65 14	0 33	SSW	16	52.4	10.6	9.3	98	Cust.	10	●°		SSW	6	10.5	
9	65 12	0 31	S$_b$W	16	51.5	10.8	9.3	97	Cust.	10	●		SSW	6	10.4	
10	65 10	0 30	S$_b$W	18	51.2	10.8	9.4	98	Cust.	10	●		SSW	6	10.4	
11	65 10	0 44	SSW	18	51.1	10.8	9.3	97	Cust.	10	●		SSW	6	10.4	
12	65 9	0 58	SSW	16	51.1	10.8	9.3	97	Cust.	10	●		SSW	6	10.4	

1876. August 11.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m	65 9	1 17 E	SSW	15	750.9	11.0	9.8	00	Cust.	10	●°		SSW	7	10.8	
2	65 9	1 36	SSW	16	49.9	11.0	9.8	00	Cust.	10			SSW	7	10.9	
3	65 9	1 55	SSW	18	49.3	11.0	9.7	99	Cust.	10	●		SSW	7	10.8	
4	65 9	2 14	SW$_b$S	17	49.0	11.0	9.8	00	Cust.	10	●		SSW	7	10.9	
5	65 9	2 33	SSW	18	49.6	11.1	9.7	99	Cust.	10	●°		SSW	7	10.7	
6	65 9	2 53	SSW	19	49.7	11.2	9.9	00	Cust.	10	●°		SSW	7	10.7	
7	65 8	2 52	SSW	14	50.1	11.6	9.9	98	Cust.	10	●°		SSW	7	10.7	
8	65 6	2 51	SSW	15	50.1	11.4	9.8	98	Cust	10	●°		SSW	7	10.7	
9	65 5	2 50	S$_b$W	13	49.9	11.6	9.9	98	Cust.	10	●°		SSW	7	11.0	
10	65 4	2 49	S$_b$W	19	49.3	11.6	9.9	98	Cust.	10	●		SSW	7	11.0	
11	65 3	2 48	SW$_b$S	21	49.0	11.7	10.1	99	Cust.	10	●°		SSW	7	11.0	
12	65 2	2 47	SSW	17	49.4	11.8	10.1	98	Cust.	10	●°		SSW	7	11.0	
1p.m.	65 1	2 46	SW$_b$S	16	50.3	11.9	10.0	97	Cust.	10	●°		SW	7	11.0	
2	65 0	2 45	SW$_b$S	17	50.7	11.8	9.8	96	Cust.	10	●°		SW	7	10.8	
3	64 59	2 44	SW$_b$S	18	51.7	11.3	9.7	98	Ci. Cist. Cu.	5			SW	7	10.8	
4	64 58	2 43	SW$_b$S	18	51.7	11.9	9.2	90	Cust.	10			SW	7	10.8	
5	64 57	2 42	SW$_b$S	15	52.6	11.8	9.3	91	Ci. Cust.	5			SW	7	11.0	
6	64 57	2 41	SW$_b$S	13	53.1	11.8	9.3	91	Ci. Cist. Cu.	5		2.5	SW	7	11.0	
7	64 56	2 41	SW	14	53.5	11.8	9.3	91	Cist. Cust.	9			SW	7	11.0	
8	64 55	2 40	SW	11	53.8	11.4	9.3	93	Cu. Cist. Ci.	8			SW	7	11.0	
9	64 54	2 39	SW	11	54.7	11.4	9.3	93	Cust.	8			SW	7	11.0	
10	64 54	2 38	SW	12	54.9	11.3	9.4	94	Cust.	9			SW	7	10.8	
11	64 53	2 38	SW	17	55.6	11.2	9.4	95	Cust.	9			SW	6	10:9	
12	64 52	2 37	SW$_b$W	14	55.4	11.1	9.4	95	Cust.	10			SW	6	11.0	

1876. August 12.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	r	Remarks.
1a.m.	64° 51′	2° 36′ E	SW	13	755.8	11.2	9.2	93	Cust.	10	●°		SW	6	10.5	
2	64 50	2 35	SW	13	55.8	11.2	9.0	92	Cust.	10			SW	6	10.5	
3	64 49	2 51	SW	12	56.0	11.2	9.2	93	Cust.	10			SW	6	10.8	
4	64 49	3 10	SW	12	56.5	11.2	9.7	98	Cust.	10			SW	6	10.8	
5	64 49	3 30	SW	13	56.7	11.4	10.1	00	Cust.	10			SW	6	10.8	
6	64 48	3 50	SW	12	56.9	11.7	10.1	99	Cust.	10			SW	6	11.0	
7	64 48	4 9	SW	12	57.1	11.6	10.2	00	Cust.	10			SW	6	11.0	
8	64 47	4 24	SW	13	57.7	11.8	10.3	00	Cust.	10	●°		SW	6	11.0	
9	64 47	4 24	SWbS	16	57.7	11.8	10.3	00	Cust.	10	≡°●°		SW	6	11.0	
10	64 47	4 24	SWbS	17	58.1	12.0	10.5	00	Cust.	10	≡°●°		SW	6	11.1	
11	64 47	4 24	SW	17	58.1	12.1	10.4	99	Cust.	10	≡●°		SW	7	11.2	
12	64 47	4 24	SWbS	15	58.0	12.1	10.4	99	Cust.	10	≡●°		SW	7	11.4	
1p.m.	64 47	4 24	SWbS	14	58.2	12.1	10.4	99	Cust.	10	≡●°		SW	7	11.2	
2	64 47	4 24	SW	15	58.5	12.1	10.4	99	Cust.	10	≡●°		SW	7	11.0	
3	64 47	4 24	SWbS	15	58.4	11.9	10.3	99	Cust.	10	≡●°		SW	7	11.0	
4	64 47	4 26	SbW	11	58.1	11.8	10.2	99	Cust.	10	≡°		SW	7	10.9	
5	64 48	4 36	SW	13	58.3	11.7	10.1	99	Cust.	10	≡		SW	7	10.9	
6	64 49	4 46	SW	12	58.7	11.6	10.2	00	Cust.	10	≡●°		SW	7	10.8	
7	64 49	4 56	SWbS	12	58.2	11.6	10.2	00	Cust.	10	≡		SW	7	11.0	
8	64 48	5 6	SW	13	58.5	11.5	10.1	00	Cust.	10	≡●°		SW	7	11.0	
9	64 47	5 22	SW	16	59.6	11.6	10.2	00	Cust.	10	≡●°		SW	7	11.2	
10	64 46	5 38	SW	15	59.5	11.5	10.1	00	Cust.	10	≡●°		SW	7	11.2	
11	64 45	5 54	SW	16	59.4	11.2	9.9	00	Cust.	10	≡●°		SW	7	11.0	
12	64 44	6 9	SW	15	59.3	11.2	9.9	00	Cust.	10	≡●°		SW	7	11.0	

1876. August 13.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	r	Remarks.
1a.m.	64 43	6 28 E	SW	13	759.1	11.2	9.9	00	Cust.	10	≡●°		SW	7	10.8	
2	64 42	6 47	SW	13	59.5	11.0	9.8	00	Cust.	10			SW	6	10.6	
3	64 41	7 6	SWbW	13	59.6	11.0	9.8	00	Cust.	10			SW	6	10.5	
4	64 40	7 24	SWbW	11	59.7	11.0	9.8	00	Cust.	10			SW	6	10.6	
5	64 38	7 42	SWbW	13	59.6	11.0	9.8	00	Cust.	10	≡●°		SW	6	10.6	
6	64 37	8 0	SWbW	14	60.0	10.8	9.6	00	Cust.	10	≡●°		SW	6	10.8	
7	64 32	8 19	WSW	15	60.3	11.0	9.8	00	Cust.	10	≡●°		WSW	6	10.8	
8	64 28	8 38	WSW	17	60.7	11.0	9.8	00	Cust.	10	≡●°		WSW	6	10.5	
9	64 27	8 37	SSW	8	60.8	11.0	9.8	00	Cust.	10	≡●°		SSW	6	10.5	
10	64 27	8 36	SSW	13	61.0	11.1	9.9	00	Cust.	10	≡●°		SSW	6	10.5	
11	64 23	8 52	WSW	12	60.9	11.2	9.9	00	Cust.	10	≡●°		WSW	6	10.6	
12	64 23	8 51	SWbW	12	61.8	11.2	9.8	99	Cust.	10	≡●°		SW	6	11.0	
1p.m.	64 21	8 49	SWbW	14	61.8	11.0	9.8	00	Cust.	10	≡●°		SW	6	10.9	⊙
2	64 21	8 47	SWbW	8	61.8	11.3	10.0	00	Cust.	10	≡●°		SW	6	11.0	⊙
3	64 20	8 43	SWbW	9	61.8	11.0	9.8	00	Cust.	10	≡●°		SW	5	11.0	⊙
4	64 21	8 49	W	10	62.1	10.3	8.7	94	Cust. Str.	8	≡●°		W	5	10.8	
5	64 18	9 3	WSW	9	62.2	10.6	8.6	91	Cust.	10	●		WSW	5	10.8	
6	64 14	9 17	WSW	9	62.4	10.5	8.9	94	Cust.	10			WSW	5	10.4	
7	64 12	9 31	WSW	9	62.8	10.5	9.1	96	Cust.	10	●		WSW	2	11.2	
8	Halten.		WbS	9	63.4	10.4	8.9	95	Cust.	10	●				11.1	
9			WbN	9	63.7	10.4	8.7	93	Cust.	10	●°				11.0	
10			WbN	5	64.0	10.0	8.7	95	Cust.	10					10.8	
11			WbN	8	64.1	9.6	8.2	92	Cust.	10	●°				10.7	
12			WbN	5	63.8	10.0	7.7	84	Cust.	10		2.0			11.2	

1876. August 21.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	r	Remarks.
1a.m.	64 41	9 10 E	ENE	7	762.3	12.6	10.1	93	Str.	1			NE	1	11.6	
2	64 41	9 0	E	8	61.0	12.6	10.3	96	Str.	1			NE	1	11.6	
3	64 42	8 48	E	8	60.5	12.5	10.4	97	Str.	1			NE	1	11.5	
4	64 43	8 31	E	8	60.0	12.3	10.5	99	Str.	1			NE	1	11.5	
5	64 44	8 19	ENE	4	59.7	12.2	10.5	99	Str.	2	⌓		NE	1	11.5	≡ in S.
6	64 44	8 9	SEbS	4	59.4	12.2	10.6	00	Str.	1	⌓		NE	1	11.6	
7	64 45	8 2	SSW	4	59.1	12.2	10.3	98	Cu.	1			NE	1	11.5	*m* horiz.
8	64 45	7 53	SbW	4	59.0	12.2	10.3	98	Cu.	1				0	11.6	
9	64 46	7 38	SSW	9	58.9	12.5	10.4	97	Ci. Str.	1	≡		NE	1	11.7	
10	64 46	7 28	SW	8	59.0	11.0	9.4	93	Ci. Cust.	8			SW	2	11.3	
11	64 47	7 17	SW	11	58.6	11.6	9.7	96	Cust.	10			SW	2	11.3	
12	64 47	7 12	SW	11	58.5	11.4	9.3	93	Cust.	10			SW	2	11.2	
1p.m.	64 47	6 56	SWbS	12	58.2	11.0	9.5	97	Cust.	10			SW	2	11.2	
2	64 48	6 45	SWbS	8	57.8	11.0	9.5	97	Cust.	10			SW	2	11.5	
3	64 48	6 40	SWbS	8	57.5	11.0	9.5	97	Cust.	10			SW	2	11.4	
4	64 48	6 32	SbW	7	57.1	10.7	9.5	99	Cust.	10			SW	2	11.6	
5	64 48	6 32	SWbW	6	56.9	10.6	9.5	00	Cust.	10	≡		SW	2	11.6	
6	64 48	6 26	SW	5	56.7	10.6	9.5	00	Cust.	10	≡		SW	2	11.6	
7	64 49	6 16	WSW	3	56.5	10.2	9.3	00	Cust.	10	≡		WSW	1	11.6	
8	64 49	6 3	S	5	56.6	10.2	9.2	99	Cust.	10	≡		SW	1	11.4	
9	64 50	5 53	SbE	6	55.5	10.4	9.4	00	Cust.	10	≡		SW	1	11.2	
10	64 50	5 39	SSW	5	55.5	10.2	9.3	00	Cust.	10	≡		SW	1	11.3	
11	64 50	5 32	SbE	6	55.4	10.4	9.4	00	Cust.	10	≡°●°		SW	1	11.3	
12	64 47	5 30	SSE	6	55.2	11.3	9.9	99	Cust.	8			SW	1	11.3	

1876. August 22.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	64° 40′	5° 30′ E	SSW	3	754.3	12.4	10.0	94	Cust.	9	⌓		S	2	11.6	
2	64 33	5 31	SSE	4	53.9	12.4	10.0	95	Cust.	10	●		SSE	2	11.8	
3	64 26	5 32	E$_b$S	5	53.8	12.2	10.1	96	Cust.	10	●		SSE	2	11.9	
4	64 19	5 33	E$_b$S	8	53.8	12.7	10.2	94	Cust.	10	●		ESE	1	11.7	
5	64 13	5 34	E$_b$S	8	53.4	12.0	10.3	99	Cust.	10	●		SW	1	11.8	
6	64 4	5 35	SW	10	53.0	12.0	10.2	98	Cust.	10	●		SW	1	11.7	
7	64 2	5 35	SE$_b$E	6	53.0	12.2	10.2	97	Cust.	10			SW	1	11.8	
8	64 2	5 37	E$_b$S	4	52.8	12.4	10.2	95	Cust.	9	●		SW	1	11.9	
9	64 2	5 39	ESE	6	52.3	12.2	10.2	97	Cust.	10			SSE	1	11.8	
10	64 2	5 42	SE	5	52.2	12.7	10.5	97	Cust.	10	●°		ESE	1	12.0	
11	64 2	5 45	S	2	51.9	13.2	11.3	00	Cust.	10	≡			0	12.1	
12	64 2	5 48	SE$_b$S	3	51.6	13.0	10.9	98	Cust.	9	≡		S	1	12.2	
1p.m.	64 2	5 50	SE	5	51.9	12.7	10.7	98	Cust. Cu.	8			SE	1	12.2	
2	64 1	5 59	ESE	2	52.0	13.2	10.9	97	Cust. Cu.	9	*m*		WSW	1	12.3	
3	63 1	6 8	ESE	3	51.5	12.6	10.2	95	Cust. Str.	7	*m*		WSW	1	12.2	
4	64 1	6 21		0	51.0	12.8	10.2	94	Cust. Str.	6	*m*	5.7		0	12.0	≡ in E.
5	64 0	6 32	NE$_b$E	3	50.6	12.6	10.3	96	Cicu. Str. Cust.	7	*m*			0	11.7	
6	64 0	6 42	NE$_b$N	6	50.0	10.6	9.5	00	Cust.	10	≡			0	11.4	
7	64 0	6 42	NE	9	50.0	10.6	9.5	00	Cust.	10	≡			0	11.2	
8	64 0	6 42	NE	10	49.8	10.5	9.5	00	Cust.	10	≡			0	11.2	
9	63 54	6 42	NE	9	49.0	11.0	9.8	00	Cust.	10	≡		NE	2	12.6	
10	63 48	6 42	NE$_b$N	10	48.0	11.2	9.9	00	Cust.	10	*m*		NNE	2	12.8	
11	63 42	6 42	NNE	10	47.6	11.6	9.9	98	Cust.	10	*m*		NNE	3	12.6	
12	63 36	6 42	NE$_b$N	12	46.7	11.4	9.8	98	Cust.	10	*m* ⌓		NNE	3	11.8	

1876. July 9.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
4a.m.	Thorshavn.		SE	11	747.5	10.1	9.2	00	Cust.	10	●		S	3	9.4	
8			NW$_b$N	6	46.1	10.9	9.5	98	Cust.	10	●≡		S		9.2	
10												4.8				
12			NW$_b$W	3	45.0	10.6	9.3	98	Cust.	10	≡		S		9.4	
4p.m.			NW$_b$W	5	44.0	10.0	9.0	99	Cust.	10	●≡		S		9.2	
8			WNW	5	43.2	9.2	8.4	98	Cust.	10	●		S		9.0	
12			W$_b$N	5	43.4	9.0	8.3	97	Cust.	10	●		S	2	8.9	

1876. July 10.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
4a.m.	Thorshavn.		SW$_b$W	5	743.7	8.8	8.2	98	Cust.	10	●			0	8.8	
8			N	7	46.4	9.8	8.8	98	Cust.	10	●			0	9.0	⊙
10												6.5				
12			N$_b$W	9	49.8	9.5	8.6	98	Cust.	10	●		E	2	9.1	⊙
4p.m.			NNW	9	52.9	10.4	7.6	81	Cust.	8			E	1	9.1	⊙
8			NW	11	55.0	8.9	8.5	00	Cust.	8			E	1	8.8	⊙
12			NW$_b$W	9	56.4	9.0	8.2	96	Cust.	9				3	9.0	Swell.

1876. July 11.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
4a.m.	Thorshavn.		N$_b$W	9	758.3	8.0	7.8	98	Cust.	8			E	1	8.9	
8			NNW	11	61.7	8.2	6.3	78	Cust.	7					8.8	∕ *q.*
10												0.0				
12			N$_b$W	7	63.7	10.8	6.7	70	Cust. Cu.	3					9.4	*q.*
4p.m.			W$_b$S	6	64.8	11.1	7.9	80	Cust. Ci.	2					9.6	
8			SE	6	64.8	9.3	8.3	95	Cust.	8					9.0	
12			SSE	4	62.8	10.4	8.9	95	Cust.	9					9.9	

1876. July 12.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
4a.m.	Thorshavn.		SW	8	760.1	9.2	8.7	00	Cust.	9	●				8.9	
8			S$_b$W	10	52.8	10.8	9.6	00	Cust.	10	●				9.4	
9												16.1				
12			WSW	19	50.4	11.6	10.2	00	Cust.	10	●				9.4	
4p.m.			WSW	7	51.6	11.8	9.8	96	Cust.	9	●				9.4	
8			NW	6	58.7	10.2	8.2	89	Cust. Cicu.	6					9.2	
12			W	3	61.5		8.0	91	Cust.	6					8.8	

1876. July 13.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
4a.m.	Thorshavn.		ENE	2	763.4	9.2	8.2	95	Cust. Ci.	9					9.2	
8			SW$_b$S	4	63.7	10.2	8.7	94	Cust.	10					9.3	
9											●°					
12			W$_b$S	6	63.1	11.3	10.0	00		10	≡				9.4	
4p.m.			SW$_b$W	13	62.4	11.6	10.2	00	Cust.	10	≡●°				9.8	
8			SSW	11	61.3	13.2	11.3	00	Cust.	10	≡●°				9.8	
12			SW	18	60.2	12.6	10.9	00	Cust.	10	●				9.4	

1876. July 14.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	r	Remarks.
4a.m	Thorshavn.		S_bW	9	760.0	10.8	9.6	00	Cust	9					9.4	
8			SSW	14	61.3	11.4	9.6	96	Cust.	9					9.4	Elevated fog.
10												18.4				
12			SW	13	64.4	11.5	9.6	96	Cust.	9					9.4	m.
4p.m.			SSW	7	64.9	11.0	9.8	00	Cust.	10 ●					9.4	
8			S_bW	10	66.6	10.9	9.5	98	Cust.	10					9.4	Elevated fog.
12			SW_bS	11	66.2	10.6	9.5	00		10 ≡●°					9.7	
1876. July 15.																
4a.m.	Thorshavn.		S_bW	8	766.8	10.5	9.2	98	Cust. Ci.	8					9.4	Elevated fog.
5												0.1				
8	Thorshavn.		SW_bS	11	66.6	10.4	9.3	99	Cust.	10					9.3	Elevated fog.
12	Kolter-Strømø.		SW_bW	8	68.1	10.6	9.5	00	Cust.	10 ≡●°			W	5	9.4	
4p.m.	Vestmanhavn.		S	5	67.4	12.0	10.5	00	Cust.	10 ≡					12.8	Elevated fog.
8			S	4	66.8	12.1	10.5	00	Cust.	10 ≡					12.0	Elevated fog.
12	Vestmanhavn.		SW	3	65.6	10.7	9.6	00	Cust.	9					11.4	Elevated fog.
1876. July 27.																
4a.m.	Rezkjavik.		SSW	4	746.6	8.9	7.4	87	Cust.	10					10.2	
8			S_bW	4	44.6	10.8	8.2	86	Cust.	9					10.3	
12			NW	4	43.7	10.8	8.4	89	Cust.	10					10.8	
4p.m.			WNW	9	42.9	10.0	8.4	92	Cust.	10					11.0	
8			NW	9	42.9	10.0	8.4	92	Cust. Ci. Cu.	8					10.3	
12			N_bW	9	42.8	9.6	7.0	79	Cust.	8					10.3	
1876. July 28.																
4a.m.	Reykjavik.		S	2	743.9	8.4	6.6	81	Cust. Cu.	3					10.5	
8			N	14	45.2	7.4	6.2	80	Cu. Ci.	7					10.2	
12			N_bE	12	46.7	8.8	6.2	73	Cust. Cu. Ci.	8					10.3	
4p.m.			N_bE	12	47.5	7.9	6.0	75	Cust. Cu. Ci.	8					10.4	
8			NE_bN	15	47.7	7.8	5.1	64	Cust. Cu.	6					10.5	
12			NNE	16	48.3	6.4	5.6	78	Cust. Cu.	7					10.3	
1876. July 29.																
4a.m.	Reykjavik.		NNE	17	748.3	6.0	5.0	72	Cust. Cu.	5					10.0	
8			N_bE	14	48.4	6.4	5.3	73	Cust. Cu.	5					9.6	
12			N	13	47.6	8.1	5.5	68	Cust. Cu.	5					10.3	
4p.m.			N_bW	11	47.2	8.1	6.0	74	Cust. Cu.	8					10.0	
8			N_bW	5	46.5	6.4	6.1	86	Cust.	7					10.2	
12			N_bE	17	46.6	6.0	5.9	85	Cust.	9					10.0	
1876. July 30.																
4a.m.	Reykjavik.		NE_bN	6	747.7	6.0	5.3	76	Cust.	9					9.7	
8			NNE	13	47.1	4.9	5.9	92	Cust.	10 ●°					9.8	
12			N_bE	19	47.1	6.4	6.0	84	Cust.	10 ●°					9.7	
1p.m.																Snow on the mountains.
4			N_bE	8	45.8	7.4	6.5	85	Cust. Ci.	8					9.4	
8			N	15	47.4	7.1	6.1	81	Cust.	8					9.8	
12			NNE	11	48.2	8.4	7.1	87	Cust.	8		0.0			9.5	
1876. July 31.																
4a.m.	Reykjavik.		N_bW	12	749.6	7.8	6.8	86	Cust. Ci.	4					8.8	
8			N_bW	11	50.4	8.8	7.5	89	Cu.	3					9.4	
12			N_bW	11	51.0	10.2	9.3	00	Cust.	1					9.8	
4p.m.			NW_bN	6	51.4	10.3	8.3	89	Cu.	1					9.8	
8			NW	7	52.1	10.0	5.9	64	Cust.	2					9.8	
12			NW	5	52.0	9.5	6.1	69	Str.	2					9.4	
1876. August 1.																
4a.m.	Reykjavik.		N_bW	3	751.8	6.7	6.4	87	Cust.	2					9.5	
8			NW	4	52.0	9.6	4.9	55	Cust	2						
12			NW	7	50.8	11.8	5.5	54	Cust. Cu.	3					10.4	
4p.m.			NNW	6	50.0	12.0	6.3	61	Cust. Cu.	3					11.0	
8			N_bW	6	49.7	10.2	7.0	76	Cust. Cicu.	4					10.8	
12			S	6	48.6	8.2	7.4	92	Cust.	9					10.2	

1877. June 15.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1 p.m.																
2	64° 15′	2° 45′ E	N	0.8	769.1	8.8	7.5	89	Str.	10			WNW	3	10.1	
3	64 23	2 46	N	0.9	69.1	8.9	7.5	88	Str.	10			WNW	3	10.0	
4	64 30	2 47	N	1.3	69.0	8.9	7.7	91	Str.	10			WNW	3	9.5	
5	64 37	2 48	N	0.9	68.5	8.2	7.8	96	Str.	10			WNW	3	9.8	
6	64 44	2 49	NbW	0.9	68.5	8.0	7.8	98	Str.	10			WNW	3	9.4	
7	64 51	2 50	N	0.7	68.6	7.7	7.7	99	Str.	10			WNW	3	9.4	
8	64 59	2 51	SSW	8.3	69.0	7.2	7.4	98	Str.	10	≡ ●°		WNW	4	9.3	
9	65 6	2 51	SSW	13.2	68.8	7.2	7.4	98	Str.	10	≡ ●°		WNW	4	8.9	
10	65 13	2 52	SWbS	7.4	68.7	6.8	7.4	00	Str.	10	≡		WSW	5	8.8	
11	65 20	2 53	SWbS	8.0	68.2	7.0	7.5	00	Str.	10	≡		WSW	4	9.2	
12	65 28	2 54	SWbS	6.7	68.1	7.0	7.4	99	Str.	10	≡		WSW	4	9.0	

1877. June 16.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1 a.m.	65 35	2 56 E	SWbS	6.8	768.1	7.0	7.4	99	Str.	10	≡		WSW	5	8.4	
2	65 42	2 57	SWbS	7.0	68.1	7.0	7.5	00	Str.	10	≡		WSW	5	8.4	
3	65 49	2 57	SWbS	8.8	68.1	7.2	7.4	98	Str.	10	≡		WSW	5	8.3	
4	65 56	2 58	SWbS	7.9	67.2	7.1	7.4	99	Str.	10	≡		WSW	5	8.5	
5	66 3	2 59	SWbS	7.9	66.3	7.2	7.4	98	Str.	10	≡		WSW	5	8.5	
6	66 8	3 0	SSW	5.6	65.9	7.5	7.2	93	Str.	10	≡		W	5	8.2	
7	66 8	3 0	SWbS	7.5	67.0	7.8	7.5	94	Str.	10			W	4	8.4	
8	66 8	3 0	SWbS	8.4	66.8	8.1	7.5	93	Cust.	10			WSW	5	8.4	
9	66 8	3 0	SSW	9.1	66.6	8.4	7.5	92	Cust.	10			SSW	5	8.6	
10	66 8	3 0	SSW	11.4	66.3	8.5	7.5	91	Cust.	10			SSW	4	8.6	
11	66 8	3 0	SSW	11.8	65.8	8.6	7.5	91	Cust.	10			SW	4	8.6	
12	66 9	3 1	SWbS	12.0	65.7	8.8	7.8	92	Cust.	10			SW	5	8.8	
1 p.m.	66 9	3 1	SWbS	10.9	66.1	8.3	7.8	96	Cust.	10			SW	5	8.3	
2	66 9	3 1	SWbS	11.8	66.0	8.5	7.7	93	Cust.	10			SW	5	8.5	
3	66 7	3 15	SWbS	11.0	66.3	8.2	7.8	96	Str.	10	●°		S	5	8.3	
4	66 6	3 35	SWbS	9.6	66.0	8.0	6.9	86	Str.	10	●°		S	5	8.2	
5	66 4	3 54	SW	8.4	66.2	8.2	7.7	94	Cust.	10	●°		S	5	8.4	
6	66 3	4 13	SW	9.0	66.3	8.2	7.7	94	Cust.	10	●°		SSW	5	8.3	
7	66 2	4 21	SW	8.8	66.3	8.3	7.8	96	Cust.	10	●°		SW	5	8.0	
8	66 0	4 38	SW	7.1	66.3	8.4	7.8	94	Cust.	10			SSW	5	8.2	
9	65 58	4 55	SW	6.8	66.3	8.6	7.9	95	Cust.	10			SSW	4	8.4	
10	65 57	5 11	SWbW	6.2	66.3	8.8	8.1	96	Cust.	10			SSW	4	9.0	
11	65 56	5 21	SW	6.6	66.3	8.6	8.3	00	Cust.	10			SW	4	9.0	
12	65 55	5 37	SWbW	6.7	66.3	8.6	8.2	99	Cust.	10			SSW	4	9.0	

1877. June 17.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1 a.m.	65° 54′	5° 53′ E	WSW	4.5	766.1	8.3	7.8	96	Str.	10	●°			5	8.9	
2	65 53	6 9	WbS	4.2	66.1	8 5	7.9	96	Str.	10	●°			5	8.9	
3	65 51	6 25	WSW	4.5	65.3	8.3	8.0	98	Str	10	●			5	8.6	
4	65 49	6 43	WSW	4.6	65.2	8.4	7.9	96	Str.	10	●			5	8.9	
5	65 47	7 1	SWbW	3.7	65.5	8.8	8.2	98	Cust.	10	●°		WSW	3	9.0	
6	65 44	7 20	W	6.0	65.1	8.7	8.3	99	Cust.	10	●°		WSW	3	8.9	
7	65 42	7 34	WbS	2.7	65.1	8.7	8.3	99	Cust.	10	●		WSW	3	9.1	
8	65 40	7 52	SW	3.0	65.1	8.4	8.2	00	Cust.	10	●°		WSW	3	8.8	
9	65 38	8 10	NbW	6.2	64.7	8.4	8.0	97	Cust.	10	●°		WSW	3	9.0	
10	65 36	8 29	NNW	8.2	64.8	8.8	8.2	98	Cust.	10	●		WSW	3	9.4	
11	65 36	8 32	N	6.2	64.6	8.4	8.0	97	Cust.	10	●		W	3	9.2	
12	65 36	8 31	NNW	4.0	64.5	8.2	7.7	94	Cust.	10	●°		W	3	9.2	
1 p.m.	65 36	8 31	NEbN	5.0	64.8	7.9	7.2	90	Cust.	10	●		W	3	9.2	
2	65 35	8 42	NWbN	5.9	64.7	8.0	7.1	89	Cust.	10		12.3	W	3	9.2	
3	65 .33	9 3	NNW	6.3	64.4	8.5	6.7	87	Cust.	10			W	3	9.0	
4	65 32	9 17	NWbN	5.6	64.4	8.2	6.9	85	Cust.	10			W	3	9.2	
5	65 30	9 37	NbW	6.	64.3	8.4	7.4	91	Cust.	10	●°		WSW	3	9.3	
6	65 28	9 53	NWbN	5.6	64.2	8.4	7.5	92	Cu. Cust.	10			WSW	2	9.1	
7	65 27	10 5	NWbN	5 3	64.4	8.4	7.3	89	Cust. Cu.	10			WSW	2	8.5	
8	65 25	10 19	NNW	5.8	64.4	8.4	7.3	89	Cu. Cust.	10			WSW	2	8.9	
9	65 24	10 33	NbW	6.3	63.9	8.2	7.3	91	Cu. Cust.	10			WSW	2	9.0	
10	65 21	10 44	NbE	6.8	63.8	8.0	6.4	81	Str.	10			WSW	2	9.0	
11	65 25	10 45	NNW	9.7	63.9	8.1	6.4	79	Str.	10			NNW	2	8.6	
12	65 32	10 48	NNW	8.7	63.8	8.0	6.4	81	Str.	10			NNW	2	8.7	

1877. June 21.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	r	Remarks.
1a.m.	67° 30′	8° 10′ E	NW$_b$N	7.0	763.4	5.4	5.3	78	Cust.	9			N	4	7.7	
2	67 29	8 20	N$_b$W	8.4	63.1	5.4	5.3	78	Cust.	9			N	4	6.8	
3	67 27	8 31	NNW	11.2	62.7	5.8	5.4	79	Cust.	9			N	4	6.4	
4	67 27	8 33	NW$_b$N	7.4	62.7	5.9			Cust.	9			N	4	7.8	Wet thermometer not sufficiently wetted.
5	67 25	8 47	NW	6.4	62.4	5.9			Cust. Cu.	9			NW	4	8.4	
6	67 24	8 58	NW	9.2	61.9	6.2			Cust.	10			WNW	4	8.2	
7	67 24	8 58	WNW	10.4	61.8	6.4			Cust.	10			WNW	3	8.2	
8	67 23	8 58	NW$_b$W	8.0	61.8	6.2			Cust. Cu.	9			NW	3	8.3	
9	67 23	8 58	NW	8.8	61.3	6.5			Cu.	9			NW	3	8.4	
10	67 22	8 58	NW	6.6	61.2	6.6	5.0	71	Cu.	9			NW	3	8.4	
11	67 22	8 58	W$_b$N	8.6	60.9	7.0	5.5	74	Cu.	9			W	3	8.4	
12	67 22	8 58	NW	7.6	61.0	7.0	4.9	66	Cu.	9			NW	3	8.4	
1p.m.	67 22	8 58	NW$_b$N	6.5	61.1	6.9	5.0	67	Cu.	9			NW	3	8.0	
2	67 22	8 58	NW	6.8	61.1	7.1	5.3	70	Cu.	9			NW	3	8.0	
3	67 22	8 58	NW	5.4	60.5	7.0	5.3	71	Cu.	9			NW	3	7.9	
4	67 21	8 59	WNW	6.4	60.5	7.0	5.9	78	Cu.	9			WNW	3	8.0	
5	67 19	9 6	NW$_b$N	6.3	60.2	7.1	5.9	78	Cu.	7			N	3	8.4	
6	67 16	9 18	NW	7.0	59.6	7.8	5.5	69	Cu.	2			NNW	3	8.0	
7	67 14	9 25	WNW	7.8	59.4	6.7	5.0	69	Cu. Cicu.	5			NW	3	8.3	
8	67 12	9 37	W	7.1	59.2	6.2	5.6	79	Cust. Cu.	9	●^{0}		NW	3	8.3	
9	67 9	9 49	W$_b$S	4.6	58.7	5.6	5.1	75	Cu.	9			WNW	3	8.2	
10	67 6	10 0	WSW	4.1	58.5	5.7	5.2	76	Cu.	9			WNW	3	8.2	
11	67 2	10 17	NW$_b$N	4.2	58.3	5.7	5.3	77	Cu.	9			NW	3	8.3	
12	66 59	10 29	NW$_b$N	7.0	58.3	5.5	5.5	82	Cu.	9			NNW	3	8 3	

1877. June 22.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	r	Remarks.
1a.m.	66 56	10 39 E	NW$_b$N	7.2	758.1	5.5	5.4	80	Cu.	9			NNW	3	8.0	
2	66 53	10 50	NNW	0.3	57.5	6.0	5.4	78	Cu.	9			ESE	3	8.8	
3	66 49	11 7	N	1.4	58.1	6.1	5.0	72	Cu.	9			ESE	3	8.0	
4	66 48	11 11	NE$_b$E	1.4	56.8	6.8	4.8	66	Cu.	9			ESE	3	8.2	
5	66 45	11 22		0 0	56.3	6.9	5.2	70	Cicu. Cu.	7			N	1	8.9	
6	66 46	11 33	ENE	1.7	56.0	6.6	4.8	67	Cicu. Cu.	6			N	1	8.6	
7	66 47	11 47	NE$_b$E	2.4	55.5	7.0	4.8	65	Cicu. Cu.	5			N	2	8.4	
8	66 48	12 1	NE$_b$E	3.6	55.2	7.0	4.9	66	Cicu. Cu.	2			N	2	8.3	
9	66 49	12 8	NE$_b$E	3.4	55.0	8.2	5.5	67	Cu. Str.	1			WNW	2	8.6	
10	66 49	12 8		0.0	54.7	8.4	5.4	66	Cu. Ci.	1			WNW	2	9.0	
11	66 49	12 8	W	10.3	54.4	7.4	5.1	66	Cu.	1			WNW	2	8.9	
12	66 54	12 21	W	10.0	54.2	8.2	4.4	55	Cu.	1			WNW	2	8.8	
1p.m.	66 59	12 31	N$_b$E	3.2	54.1	7.0	5.2	70	Cu.	2			NNE	2	8.8	
2	67 4	12 41	N$_b$E	3.7	54.1	6.9	4.9	66	Cu.	2			NNE	2	8.8	
3	67 9	12 50	N$_b$E	3.2	53.2	6.8	5.2	71	Cu.	2			NNE	2	7.8	
4	67 14	13 0	N	4.2	52 1	6.0	5.4	78	Cu.	2			NNE	2	7.2	
5	67 19	13 10	N	6.1	51.8	7.2	4.9	65	Cicu. Ci.	2			NNW	1	8.0	
6	67 24	13 20	N	5.3	51.3	7.2	5.2	69	Ci. Str.	1			NNW	1	8.1	
7	67 27	13 25	NNE	5.8	50.6	6.8	5.4	73	Ci. Cicu. Cu.	1			NNW	1	7.4	
8	67 27	13 25	NNE	5.7	50.0	6.8	5.7	77	Ci. Str. Cu. Cicu.	1			NNW	1	7.4	
9	67 27	13 25	NNE	6.1	49.3	6.9	5.6	76	Ci. Str. Cu. Cicu.	1			NNW	1	7.4	
10	67 27	13 25	WNW	5.6	48.9	6.9	5.8	79	Cust. Cu.	1			NE	1	7.6	
11	67 27	13 25	WNW	6.9	48.5	6.8	5.7	77	Cust. Cu.	1			NE	1	7.8	
12	67 27	13 25	WNW	8.1	48.4	6.8	6.1	82	Cust. Cu.	1			NE	1	7.8	

1877. June 23.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	r	Remarks.
1a.m.	67 27	13 25 E	N$_b$E	6.7	748.2	6.5	5.7	80	Cust. Cu.	1			NNE	1	7.5	
2	67 34	13 35	N$_b$E	5.4	47.7	6.2	5.7	81	Cust. Cu.	1			NNE	1	7.2	
3	67 42	13 45	N$_b$E	6.9	47.1	6.2	5.7	81	Cust. Cu.	1			NNE	1	7.5	
4	67 50	13 55	N$_b$E	5.3	47.1	6.5	5.4	75	Cust. Cu.	1			N	1	7 8	
5	67 52	13 57	N$_b$W	6.0	46.6	6.4	5.6	78	Cust. Cu.	4			NNW	1	7.8	
6	67 52	13 57	N$_b$W	6.0	46.0	7.8	5.1	64	Cu. Cicu.	2			NNW	1	7.7	
7	67 52	13 57	NE$_b$N	4.0	45.8	8.3	6.1	74	Str. Cicu.	1			N	1	8.2	
8	67 52	13 57	ESE	5.7	46.0	8.8	6.2	73	Cicu. Cu.	1			N	1	8.2	
9	67 52	13 57	SE$_b$E	3.0	46.3	8.4	6.2	76	Cu.	1			N	1	8.2	
10	67 46	14 2	ENE	2.5	46.1	8.4	6.0	73	Cu.	1			N	1	9.1	
11	67 40	14 8	NW$_b$N	6.4	46.1	8.7	5.9	70	Cu.	1			N	1	10.0	
12	67 32	14 16	NW	6.0	46.1	9.6	6.1	69	Cu.	1			W	1	9.8	
1p.m.	67 25	14 29	NW$_b$N	8.5	46.1	8.5	4.9	59	Cu.	1			WNW	1	8.0	
2	67 18	14 18	W$_b$S	7.0	46.5	8.9	5.1	61	Cu.	1			W	1	7.2	
3	Bodø.															
4																
5																
6																
7																
8			N$_b$W	4.0	46.0	8.2	4.5	56	Ci. Str.	1			NNW	1	8.0	
9																
10																
11																
12																

1877. July 2.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1a.m.																
2																
3																
4																
5																
6	Sortland.															
7																
8	69° 1′	15° 25′ E	SEbS	4.8	755.9	10.4	7.8	84	Cust. Cu.	9				0	8.2	⊙
9	69 7	15 14	SE	5.2	55.6	10.6	8.1	85	Cust. Cu.	10			SE	0	8.0	
10	69 10	15 3	S	6.3	55.7	10.4	7.6	81	Cust. Cu.	10		3.1	SSE	4	8.8	
11	69 11	14 59	SbE	4.4	55.6	10 7	7.8	82	Cust. Cu.	10			WSW	5	9.2	
12	69 14	14 47	S	4.7	55.6	10.9	7.7	79	Cust. Cu.	10			WSW	5	9.1	
1p.m.	69 18	14 29	SEbS	2.8	56.3	10.9	7.7	79	Cust. Cu.	9			SW	5	8.2	
2	69 18	14 29	SWbS	3.1	56.5	11.4	7.7	77	Cust. Cu.	9			SSW	4	8.8	
3	69 18	14 29	SWbS	3.0	55.9	11.9	7.9	76	Cust.	9			SSW	4	9.0	
4	69 17	14 32	SEbE	2.5	55.9	10.9	8.5	89	Cust.	9			SE	4	8.8	
5	69 12	14 47	NE	3.5	55.6	10.8	8.1	84	Cist. Ci.	9			SW	3	9.1	
6	69 15	14 40	EbN	4.0	56.0	10.2	7.7	83	Cust.	10			SW	3	8.9	
7	69 17	14 35	E	3.9	55.5	10.2	8.0	86	Cust.	10	●°		SW	3	9.2	
8	69 17	14 35	NEbN	4 3	55.5	9.8	7.9	87	Cust.	9	●°		WSW	4	8.3	
9	69 17	14 35	NEbN	3.0	55.6	9.2	8.0	92	Cust. Cu.	9	●°		SE	2	9.2	
10	69 17	14 35	NEbN	4.1	55.6	9.2	8.1	93	Cust. Cu.	9			W	2	9.2	
11	69 18	14 33	NE	3.9	55.3	9.0	7.8	92	Cu.	2			W	2	9.0	
12	69 18	14 33	NbE	4.6	55.5	8.8	7.9	93	Cu.	4			WNW	2	8.0	

1877. July 3.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1a.m.	69 18	14 32 E	SWbW	5.0	755.1	9.0	7.6	89	Cu.	1			SE	2	9.0	
2	69 18	15 0	WSW	6.4	55.0	9.0	8.3	97	Cu.	1			SE	2	8.9	
3	69 18	14 47	N	4.8	55.3	10.4	8.0	85	Cu.	1			NNW	2	8.8	
4	69 18	14 47	NbW	3.8	55.3	10.0	8.0	87	Cu.	1			NNW	2	8.6	
5	69 18	14 47	NE	3.4	55.6	10.4	8.0	85	Ci. Cist.	1			SW	3	8.9	⊙
6	69 18	14 47		0.0	55 6	11.2	8.2	83	Ci. Cist.	1			SW	3	8.9	⊙
7	69 18	14 47		0.0	55.7	11.5	8.4	83	Ci. Cu.	2			SW	3	9.6	
8	69 18	14 47	NW	3.6	55.8	11.6	8.2	80	Ci. Cu. Cist.	2			WSW	3	9.6	
9	69 18	14 32		0.0	56.2	11.2	8.6	86	Ci. Cu.	4			E	1	9.8	
10	69 18	14 32		0.0	56.3	12.0	8.7	84	Ci. Cu.	3			E	1	9.8	
11	69 18	14 32	SWbW	2.8	56.6	12.3	8.0	75	Cust. Cu. Ci.	4			SW	1	10.4	
12	69 18	14 32	SWbS	3.4	56.6	12.2	8.7	83	Cust. Cu. Ci.	4			SW	1	9.8	
1p.m.	69 18	14 32	N	2.7	56.9	12.2	8.8	84	Str. Ci. Cu.	7			SSW	2	9.8	
2	69 19	14 24	SEbS	0.9	57.1	12.4	8.9	85	Str. Ci. Cu.	7			SW	2	9.8	
3	69 22	14 7	WbN	1.9	57.2	12.4	9.6	90	Str. Ci. Cu.	7			SW	2	10.8	
4	69 25	13 49	NW	2.7	57.0	11.2	8.4	85	Str. Ci. Cu.	7			SW	2	10.0	
5	69 25	13 49	NNW	2.6	57.0	12.2	8.6	82	Str. Ci.	6			WSW	2	10.5	
6	69 25	13 49	NW	2.9	57.0	11.4	8.2	82	Str. Ci.	5			WSW	2	10.4	
7	69 25	13 49		0.0	57.0	10.9	8.4	87	Ci. Str.	5			WSW	2	10.4	
8	69 25	13 49		0.0	56.8	10.8	8.4	89	Ci. Str. Cist.	4			W	2	9.7	
9	69 25	13 49		0.0	56.7	11.2	8.3	84	Cu. Ci.	2			W	1	9.8	
10	69 25	13 49	NWbW	3.4	56.8	10.4	8.2	88	Cu. Ci. Cust.	3			WSW	1	9.4	
11	69 25	13 49	NWbW	3.6	56.5	9.2	7.6	89	Cu. Cust. Ci.	4			W	1	9.2	
12	69 25	13 49	NWbN	4.8	56.7	8.6	7.7	92	Cu. Cust. Ci.	2			NNE	1	9.3	

1877. July 4.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1a.m.	69 25	13 49 E	NbE	5.6	756.0	8.0	7.5	93	Cu. Cust. Ci.	6			N	2	9.0	
2	69 25	13 45	NbE	5 0	55.8	7.9	7.2	90	Cu. Cust.	6			NE	2	9.0	
3	69 26	13 20	N	4.2	56.1	7.2	7.4	98	Str.	7	≡		NE	2	9.5	
4	69 28	12 55	N	4.4	56.1	7.0	7.4	99		7	≡		NE	2	9.0	
5	69 29	12 31	NNE	7.4	55.8	7.0	7.3	98	Cust.	10	≡°		WSW	3	8.8	
6	69 29	12 26	NbE	4.8	56.2	7.1	7.3	98	Cust.	10	≡°		W	3	8.8	
7	69 29	12 17	NNE	7.2	56.0	7.2	7.4	98	Cust.	10	≡°		W	3	8.8	
8	69 30	11 55	NNE	8.3	56.5	7.0	7.3	98	Cust.	10	≡°●°		W	3	8.8	
9	69 31	11 32	NEbN	6.0	56.6	7.0	7.0	94	Cust.	10			W	2	8.6	
10	69 32	11 10	NE	6.1	56.8	7.2	7.0	93	Cust.	10			W	2	8.8	
11	69 32	11 10	NbW	3.0	57.0	7.4	7.2	94	Cust.	10			WSW	2	8.7	
12	69 33	11 0	NEbN	7.4	56.5	7.8	7.1	90	Cust.	10			WSW	2	9.0	
1p.m.	69 35	10 38	NE	6.0	57.3	7.9	6.9	88	Cust.	10			SW	2	9.0	
2	69 37	10 17	NbE	5.0	57.2	7.9	6.9	88	Cust.	10			SW	2	8.2	
3	69 39	9 55	NbE	4.8	57.4	7.5	7.1	91	Cust.	10			SW	2	8.0	
4	69 39	9 55	N	4.0	57.5	7.5	7.1	91	Cust.	10			S	2	8.2	
5	69 40	9 44	N	6.2	57.7	7.4	6.8	89	Cust.	10			SW	3	8.8	
6	69 42	9 22	NNE	3.2	58.0	7.6	6.8	88	Cust.	10			SW	3	8.8	
7	69 44	9 0	NbE	3.9	58.2	7.8	6.7	85	Cust.	10			SW	3	8.8	
8	69 45	8 4[illegible]	NbW	3.4	58.7	7.9	6.7	85	Cust.	10			ESE	3	8.9	
9	69 45	8 43	NbW	4.4	58.7	8.0	6.7	83	Cust.	10			ESE	2	8.8	
10	69 47	8 24	NE	5.3	58.6	7.8	6.6	83	Cust.	10			SSE	2	8.8	
11	69 49	8 2	NEbN	5.4	58.6	7.7	6.6	85	Cust.	9			SW	1	8.9	
12	69 51	7 40	NEbN	4.0	58.9	8.0	6.7	83	Cust.	10			SW	1	8.6	

1877. July 5.

h	*φ*	*λ*	*a*	*W*	*b*	*t*	*e*	*r*	*n*	*q*	*p*	*o*	*u*	*g*	*r*	Remarks.
1a.m.	69° 51′	7° 30′ E	NNW	3.1	758.8	8.0	6.9	86	Cust.	10			SW	2	8.5	
2	69 51	7 30	NNE	3.7	59.0	7.9	6.8	86	Cust.	10			SW	2	8.5	
3	69 54	7 8	NEbE	2.2	59.0	7.2	7.4	98	Cust.	10			SSW	2	8.0	
4	69 56	6 46	NEbE	2.2	59.0	8.0	6.9	86	Cust.	10			SSW	2	8.5	
5	69 59	6 24	SbE	3.0	58.9	8.0	7.1	89	Cust.	10			SSW	2	8.7	
6	69 59	6 15	SSE	3.4	59.0	8.2	7.2	89	Cust. Cu. Nim.	9	●°		SSW	2	8.5	
7	69 59	6 15	S	2.0	59.3	8.4	7.5	92	Cust. Cu.	10	●°		SSW	2	8.6	
8	69 59	6 15	S	4.6	59.2	8.2	7.4	92	Cust. Cu.	10	●		SSW	2	8.6	
9	69 59	6 15	WSW	2.2	59.4	8.4	7.5	92	Cust.	10			SSE	2	8.6	
10	69 59	6 15	SEbE	5.4	59.4	9.1	7.3	86	Cust. Ci.	10		1.7	SSE	2	8.8	
11	69 59	6 15	SEbE	5.1	59.5	8.4	7.5	92	Cust.	10			SSE	2	8.7	
12	69 57	6 19	SEbE	3.2	59.4	8.6	7.7	92	Cust.	10			SSE	2	8.8	
1p.m.	69 57	6 19	SE	2.1	59.3	9.5	7.6	87	Cust.	10			SSE	2	9.0	
2	69 57	6 19	NEbE	5.2	59.1	8.0	6.9	86	Cust.	10			NE	2	9.0	
3	69 57	6 19	NNE	7.0	59.3	7.9	6.9	88	Cust.	10			NE	2	8.5	
4	69 57	6 19	NNW	3.0	59.6	7.8	7.0	89	Cust.	8			NNW	2	8.5	
5	69 57	6 19	N	4.2	59.7	8.2	6.8	83	Cu. Nim.	9			NNW	2	9.0	
6	69 57	6 19	NbW	4.9	59.7	7.4	6.4	83	Cust. Cu.	10			N	2	9.0	
7	69 57	6 19	NbW	6.3	59.7	8.0	7.1	89	Cust. Cu.	10			N	2	8.9	
8	69 57	6 19	NbW	7.0	59.3	6.2	6.0	85	Cust.	10			N	2	8.7	
9	69 57	6 19	N	5.3	59.3	6.0	5.5	79	Cust.	10			N	2	8.8	
10	69 57	6 19	NbE	5.4	59.2	5.6	5.5	82	Cust.	10			NW	2	8.3	
11	69 57	6 19	NNE	3.8	59.1	6.2	5.8	82	Cust.	10			NNW	2	8.7	
12	69 58	6 29	NNW	6.3	59.2	6.1	5.8	83	Cust.	10			NW	2	8.8	

1877. July 6.

h	*φ*	*λ*	*a*	*W*	*b*	*t*	*e*	*r*	*n*	*q*	*p*	*o*	*u*	*g*	*r*	Remarks.
1a.m.	69 58	6 50 E	NbW	5.8	758.7	6.2	6.4	90	Cust.	10			NW	2	7.2	
2	69 59	7 11	NNW	5.6	58.3	6.4	6.2	87	Cust.	10			NW	2	8.5	
3	70 0	7 33	NbW	6.0	58.3	6.5	5.8	81	Cust.	10			NW	2	8.5	
4	70 0	7 54	NbW	5.5	58.3	7.0	6.4	85	Cust.	10			NW	2	8.5	
5	70 1	8 16	NbW	7.0	57.8	7.0	7.0	94	Cust.	10	●°		NNE	1	8.8	≡●
6	70 2	8 38	NbW	7.8	57.8	7.3	7.2	94	Cust.	10	●°		NNE	1	8.8	≡●
7	70 2	9 1	NbW	5.5	57.8	7.3	7.1	93	Cust.	10	●°		NNE	2	8.8	≡●
8	70 3	9 22	NbE	4.2	58 1	7.0	6.9	92	Cust.	10	●°		NNE	2	8.0	≡●
9	70 4	9 43	N	3.2	57.9	6.8	7.0	94	Cust.	10	●°		NNE	2	7.7	≡●
10	70 4	9 50	EbN	3.3	57.8	7.2	7.0	93	Cust.	10			NE	2	7.6	
11	70 4	9 50	NbE	4.6	57.8	7.2	7.0	93	Cust.	10	●°		NNE	2	7.6	≡●
12	70 4	9 55	N	6.1	58.2	7.2	6.9	91	Cust.	10			NE	2	7.6	
1p.m.	70 4	10 16	NNW	6.0	58.2	7.0	6.6	88	Cust.	10			NNW	2	8.5	
2	70 4	10 36	NNW	6.0	58.0	7.2	6.5	86	Cust.	10			NNW	2	8.5	
3	70 4	10 57	NWbN	5.0	58.0	7.2	6.5	86	Cust.	10			NNW	2	8.5	
4	70 3	11 19	NWbN	5.3	58.0	7.2	7.1	94	Cust.	10			NNW	2	8.0	
5	70 3	11 40	NbW	6.9	58.0	7.6	7.1	91	Cust.	10			N	2	8.9	≡●
6	70 3	12 1	N	6.0	58.0	7.4	7.2	94	Cust.	10			N	2	8.4	≡●
7	70 3	12 23	ENE	1.8	58.0	7.5	7.2	93	Cust.	10			NNE	2	9.0	⊙
8	70 3	12 44	N	3.6	58.0	7.9	6.7	85	Cust.	10			NNE	2	8.8	≡●
9	70 3	13 6	NEbN	4.5	57.9	7.4	7.5	98	Cust.	10	●°		NNE	2	9.0	
10	70 3	13 26	NEbN	5.3	57.8	7.2	7.1	94	Cust.	10			NNE	2	8.9	
11	70 3	13 37	ENE	5.1	57.9	7.2	6.7	89	Cust.	10			NNE	2	8.8	
12	70 3	13 37	NNE	4.5	58.0	7.2	6.7	89	Cust.	10			NNE	2	8.7	

1877. July 7.

h	*φ*	*λ*	*a*	*W*	*b*	*t*	*e*	*r*	*n*	*q*	*p*	*o*	*u*	*g*	*r*	Remarks.
1a.m.	69 59	13 58 E	NEbN	5.8	758.1	7.0	6.5	87	Cust.	10			NNE	2	8.2	
2	69 56	14 18	NEbN	5.3	57.8	6.8	6.3	85	Cust.	10			NNE	2	8.0	
3	69 56	14 18	NEbE	5.8	57.9	6.8	6.3	85	Cust.	10			NNE	2	7.5	
4	69 54	14 29	NNE	5.6	57.9	6.8	6 3	85	Cust.	10			NNE	2	8.8	
5	69 52	14 41	NbE	3.4	58.2	6.8	6.2	84	Cust. Cu.	10			NNW	2	8.5	
6	69 51	14 41	NE	5.8	58.3	6.8	5.9	80	Cust. Cu.	10			NW	2	8.5	
7	69 47	15 5	NbE	4.6	58.5	7.0	5.6	75	Cust. Cu.	10			NW	2	8.3	
8	69 47	15 8	EbN	4.0	58.7	7.4	5.7	74	Cust. Cu.	10			NW	2	9.0	
9	69 43	15 29	NWbN	7.1	58.7	8.0	6.0	75	Cust. Cu.	10			NNE	2	9.0	
10	69 43	15 29	N	4.0	59.0	8.2	5.7	70	Cust. Cu.	10			NNE	2	9.0	
11	69 41	15 42	N	4.4	59.2	8.0	5.6	69	Cust. Cu.	10			NNE	2	9.6	
12	69 42	15 44	NNW	9.8	59.1	8.2	7.1	88	Cust. Cu.	10			NNE	2	9.3	
1p.m.	69 41	15 51	NEbN	3.9	59.4	8.2	6.3	78	Cust. Cu.	10			NE	2	9.4	
2	69 41	15 51	NbE	6.6	59.3	8.0	6.3	79	Cust. Cu.	10			NNE	2	9.2	
3	69 41	15 51	NNE	4.0	59.7	8.0	6.8	85	Cust. Cu.	10			NNE	2	9.2	
4	69 41	15 51	NNE	3.6	59.6	8.2	6.5	81	Cust. Cu.	10			NNE	2	9.0	
5	69 41	15 51	NEbN	5.3	60.1	7.9	6.6	83	Cust. Cu.	10			NNE	2	9.3	
6	69 41	15 51	NEbE	5.6	60.1	7.6	6.9	89	Cust. Cu.	10			ENE	2	9.3	
7	69 41	15 51	NNE	5.2	60.1	7.4	6.7	88	Cust. Cu.	10			NNE	3	9.3	
8	69 42	16 5	NE	5.7	60.2	7.2	6.7	89	Cust.	10	●°		NE	4	9.0	
9	69 44	16 24	E	10.5	59.9	7.2	6.5	86	Cust. Cu.	10			NE	4	9.2	
10	69 46	16 15	NEbE	8.0	59.8	7.2	6.4	84	Cust.	10			NE	4	9.2	
11	69 46	16 15	NNE	7.8	60.0	7.3	6.2	82	Cust. Cu.	10			NNE	4	9.0	
12	69 46	16 15	NbE	8.0	59.7	7.2	6.1	80	Cust. Cu.	10			NNE	4	9.2	

1877. July 8.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	69° 46′	16° 15′ E	NE$_b$E	5.6	759.5	7.2	6.2	82	Cust. Cu.	9			NE	2	8.0	
2	69 46	16 15	E$_b$N	5.8	59.5	7.2	6.3	83	Cust. Cu.	9			NE	2	8.0	
3	69 46	16 22	NE$_b$E	11.2	59.2	7.0	5.9	78	Cust. Cu.	9			NE	2	7.5	
4	69 44	16 48	NE$_b$E	11.0	58.6	7.2	5.7	76	Cust. Cu.	9			NE	3	7.5	
5	69 44	17 5	NE$_b$E	10.7	58.6	7.2	6.0	79	Cust. Cu.	9			NE	3	8.9	
6	69 43	17 16	NE$_b$E	10.2	58.2	7.5	5.5	70	Cust. Cu.	9			NNE	3	9.2	
7	69 41	17 30	NE	8.9	58.1	7.2	5.9	77	Cust. Cicu.	6			NNE	3	9.2	
8	69 40	17 44	NE$_b$N	6.0	57.7	7.8	6.1	78	Str. Cu.	5			N	2	7.2	
9	69 35	17 58	N	2.9	58.1	11.4	6.7	66	Str. Cu.	5			NE	2	9.8	
10	69 31	18 11	NE$_b$E	7.2	56.6	9.2	5.8	67	Cu.	5			ENE	2	10.2	
11	69 30	18 22	NE	5.9	56.5	9.4	6.1	70	Cu.	5			ENE	2	7.2	
12	69 32	18 37	E$_b$N	11.3	56.0	9.4	5.8	66	Cu. Ci.	5			ENE	2	7.0	
1p.m.	69 35	18 50														
2	Tromsø.		NNE	13.6	55.4	9.0	6.3	73	Cu. Ci.	5			NE	2	8.2	
3																
4																
5																
6																
7																
8			NE$_b$E	2.8	54.5	10.2	6.0	65	Ci. Cust.	8			ENE	1	6.8	
9																
10																
11																
12																

1877. July 16.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	Kjosen.			0.0	760.5	9.0	8.1	95	Cust.	10 ●				0	9.4	● ≡°
2				0.0	60.5	9.2	8.0	92	Cust.	10 ●°				0	9.4	● ≡°
3	69 37	19 47 E	W	2.3	60.1	8.5	7.9	96	Cust.	10			W		8.2	
4	69 44	19 45	NW$_b$W	3.0	59.9	8.0	7.9	99	Cust.	10			NNW		7.2	
5	69 51	19 52	E$_b$N	4.6	59.9	8.4	8.1	99	Cust.	10 ●°			NNW	1	8.2	
6	69 57	20 1	NE$_b$N	1.5	60.0	8.6	8.2	99	Cust.	10 ●°			NNW	1	8.3	
7	70 4	20 9	NE$_b$E	1.6	59.8	8.6	8.2	99	Cust.	10 ●			NNW	1	8.9	
8	70 10	20 18	NW	1.6	59.9	8.1	8.0	99	Cust.	10 ●			NNW	1	8.5	
9	70 16	20 27	NNW	4.4	59.8	8.0	7.8	98	Cust.	10 ●			NNW	1	8.0	≡
10	70 22	20 35	N$_b$W	6.2	60.2	8.0	7.8	98	Cust.	10 ●°			NNW	2	7.2	≡
11	70 28	20 43	NNE	7.4	60.5	8.0	7.8	98	Cust.	10 ●°			N	2	7.4	
12	70 32	20 50	NE$_b$N	7.8	60.6	7.8	7.7	98	Cust.	10 ●°			NNE	3	7.4	
1p.m.	70 34	20 36	NE$_b$E	10.8	60.5	7.5	7.7	00	Cust.	10 ●°			NE	3	7.2	
2	70 35	20 31	NE$_b$E	15.4	60.9	7.5	7.4	96	Cust.	10 ●°			NE	3	7.2	
3	70 39	20 11	NE$_b$E	15.6	61.3	7.8	7.2	92	Cust.	10 ●°			NE	5	7.5	
4	70 42	19 52	NE$_b$E	14.2	61.8	7.5	7.2	93	Cust.	10 ●°			NE	5	7.7	
5	70 46	19 34	NE$_b$N	11.8	62.6	7.5	6.9	89	Cust.	10			NNE	4	7.8	
6	70 49	19 16	NNE	12.1	63.0	7.6	6.9	89	Cust.	10			NNE	4	7.9	
7	70 53	18 57	NNE	11.6	63.5	7.2	6.7	89	Cust.	10		20.0	NNE	4	8.0	
8	70 55	18 38	NE	8.7	63.9	6.6	6.6	91	Cust.	10			NE	4	7.8	
9	70 55	18 38	NE	9.8	64.1	6.6	6.2	85	Cust.	10			NE	4	7.4	
10	70 55	18 38	NE$_b$E	10.5	64.5	6.8	6.1	82	Cust.	10			ENE	4	7.6	
11	70 59	18 21	ENE	12.0	64.9	6.6	6.2	85	Cust.	10			ENE	4	7.8	
12	71 2	18 2	ENE	12.4	64.8	6.2	6.0	85	Cust.	10			ENE	4	7.6	

1877. July 17.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	71 5	17 43 E	E$_b$N	12.5	765.3	5.8	5.5	81	Cust.	10			NE	4	6.8	
2	71 7	17 28	NNE	14.6	64.9	6.0	5.7	82	Cust.	10			NNE	4	6.2	
3	71 10	17 9	E$_b$N	12.2	65.4	6.0	5.9	85	Cust.	10			NE	4	6.0	
4	71 13	16 52	N$_b$E	10.6	65.4	6.0	5.7	82	Cust.	10			NNE	4	6.0	
5	71 16	16 34	NE	8.6	65.7	6.2	6.0	85	Cust.	10			NE	4	8.0	
6	71 18	16 16	NE$_b$N	10.1	65.6	6.0	5.7	82	Cust.	10			NE	4	8.2	
7	71 18	16 16	NE$_b$E	10.8	65.8	6.0	5.9	85	Cust.	10			NNE	3	7.8	
8	71 20	16 9	NE$_b$N	10.8	65.8	6.4	5.9	83	Cust	10			NE	3	8.2	
9	71 24	15 48	ENE	9.6	65.5	6.6	6.0	83	Cust.	10			NE	3	8.0	
10	71 25	15 40	NE	10.4	65.7	6.8	5.9	80	Cust.	10			NE	3	7.8	
11	71 26	15 45	NNE	9.4	65.7	6.4	6.0	84	Cust.	10			NNE	3	8.2	
12	71 27	15 49	NE	8.0	65.6	6.4	5.9	83	Cust.	10			NE	3	8.2	
1p.m.	71 27	15 49	NE	8.4	65.3	6.4	5.9	83	Cust.	10			NE	3	8.0	
2	71 27	15 49	NE	8.3	65.6	6.4	5.9	83	Cust.	10			NE	3	7.5	
3	71 27	15 49	NE$_b$E	9.0	65.2	6.4	5.9	83	Cust.	10			ENE	3	8.0	
4	71 27	15 49	NE$_b$E	7.9	65.3	6.3	5.8	81	Cust.	10			NE	3	8.0	
5	71 27	15 49	NE$_b$E	8.9	64.9	6.3	5.8	81	Cust.	10			ENE	3	8.0	
6	71 27	15 49	NE$_b$E	9.8	64.6	6.4	5.9	83	Cust.	10			ENE	3	8.1	
7	71 27	15 49	E$_b$N	10.6	64.4	6.4	6.1	86	Cust. Str.	10			E	3	8.1	
8	71 27	15 49	E$_b$N	11.6	64.5	6.2	5.8	82	Cust. Str.	10			ENE	3	8.0	
9	71 29	15 41	E$_b$S	12.6	64.1	5.8	5.9	87	Cust.	10			E	3	7.8	
10	71 31	15 30	E$_b$N	10.0	64.0	6.0	5.9	85	Cust.	10			E	3	8.0	
11	71 31	15 26	E$_b$N	10.3	64.3	5.8	5.8	85	Cust.	10			E	3	8.0	
12	71 31	15 3	E$_b$N	11.2	63.9	5.8	5.7	84	Cust.	10			E	3	8.0	

1877. July 24.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1 a.m.	Tromsø.															
2																
3																
4																
5																
6																
7																
8	Malangen Fjord.		SbW	2.8	756.1	10.7	6.9	68	Cu.	3				0	7.0	
9																
10																
11																
12	69° 44′	16° 27′ E	NE	6.7	56.2	10.2	7.4	79	Cu. Ci.	1			N	1	9.0	
1 p.m.	69 45	16 7	NEbN	8.2	56.2	9.8	7.3	82	Cu. Ci.	1			N	1	9.2	
2	69 46	15 48	NEbN	9.1	56.2	9.9	7.4	82	Cu. Ci.	2			N	1	9.2	
3	69 47	15 27	NEbN	10.9	56.5	8.4	6.9	84	Ci. Cu.	4			N	3	9.4	
4	69 48	15 4	NEbN	11.1	56.1	7.8	6.8	86	Ci. Cu.	4			N	3	8.8	
5	69 49	14 41	NE	10.0	56.5	7.9	6.7	85	Cicu. Cist.	4			NNE	4	9.6	
6	69 50	14 18	NE	9.3	56.6	7.8	6.7	85	Cicu. Str.	5			NNE	4	9.3	
7	69 51	13 55	NE	9.2	56.4	7.6	6.9	89	Cist.	1			NNE	4	8.6	
8	69 52	13 32	NE	9.9	56.4	7.5	6.6	86	Ci.	2			NNE	4	8.9	
9	69 53	13 9	ENE	10.0	56.2	7.8	6.8	86	Ci. Cu.	2			NNE	3	8.4	
10	69 54	12 48	ENE	12.1	56.3	7.6	6.7	86	Ci. Cu.	2			NE	3	8.6	
11	69 55	12 26	ENE	10.9	56.1	7.4	6.8	89	Cust. Cu. Ci.	2			NE	3	9.2	
12	69 55	12 4	ENE	11.6	56.0	7.4	6.8	89	Cust. Ci.	2			NE	3	9.0	

1877. July 25.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1 a.m.	69 56	11 43 E	ENE	12.6	755.9	7.2	6.7	89	Cust. Ci.	3			ENE	3	8.2	
2	69 57	11 21	ENE	12.6	55.9	7.0	6.6	88	Cust. Ci.	3			ENE	3	8.2	
3	69 58	10 59	ENE	12.4	55.5	7.2	6.7	89	Cust. Ci.	3			ENE	3	8.0	
4	69 59	10 37	ENE	11.4	55.0	7.8	6.5	82	Cust Ci.	3			ENE	3	7.5	
5	70 0	10 14	ENE	12.0	55.1	7.8	7.0	89	Nim. Cust.	4			ENE	4	8.5	
6	70 1	9 52	ENE	11.6	54.8	7.2	6.7	89	Cicu.	4			ENE	4	7.8	Elevated fog.
7	70 2	9 30	ENE	11.6	54.6	7.2	6.6	86	Cicu. Cust.	10			ENE	4	8.0	Elevated fog.
8	70 3	9 7	EbN	13.0	54.6	7.4	6.9	90	Cust.	10			ENE	4	8.0	Elevated fog.
9	70 4	8 45	EbN	10.8	54.5	7.6	7.1	91	Cu. Cust. Ci.	8			ENE	5	8.0	
10	70 5	8 22	EbN	11.4	54.4	7.6	6.6	85	Cust. Ci.	5			ENE	5	8.0	
11	70 6	8 0	EbN	11.9	54.2	7.8	7.2	92	Cust.	10			ENE	5	8.6	
12	70 7	7 39	E	11.3	54.1	8.2	7.3	91	Cust.	10			E	5	8.4	
1 p.m.	70 8	7 15	E	13.2	54.0	8.4	7.2	88	Cust.	10			E	4	8.0	
2	70 9	6 51	E	13.0	53.4	8.4	7.8	94	Cust.	10			E	4	8.0	
3	70 10	6 26	E	9.9	53.1	8.4	7.8	94	Cust.	10			E	4	8.2	
4	70 11	6 4	E	10.2	52.8	9.0	7.8	92	Str.	10			E	4	9.0	
5	70 12	5 41	E	9.0	53.0	9.2	7.8	91	Str.	10			E	4	8.2	
6	70 13	5 20	E	8.7	52.8	9.0	7.8	92	Str.	10			E	4	8.6	
7	70 15	4 58	E	9.7	52.8	8.8	7.9	93	Str.	10			E	4	8.3	
8	70 16	4 37	E	9.0	52.3	8.6	7.9	95	Str.	10	●°		E	3	8.0	
9	70 17	4 14	E	8.2	52.2	8.5	7.9	96	Cust.	10	●		E	3	7.8	≡
10	70 18	3 51	ESE	5.7	52.2	8.2	7.9	98	Cust.	10	●°		E	3	7.8	
11	70 19	3 30	S	8.7	52.0	8.4	8.0	97	Cust.	10	●°		ENE	3	7.8	
12	70 20	3 9	S	9.3	52.2	8.4	8.2	00	Cust.	10			ENE	3	7.8	

1877. July 26.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1 a.m.	70° 22′	2° 49′ E	SWbW	5.0	752.5	8.2	7.9	98	Cust.	10			ENE	3	7.8	≡
2	70 23	2 30	SWbW	5.7	52.5	8.2	7.9	98	Cust.	10			ENE	3	8.2	≡
3	70 23	2 30	WSW	5.6	53.1	8.4	8.0	97	Cust.	10			ENE	3	8.0	
4	70 23	2 30	SW	4.8	53.1	8.8	8.0	95	Cust.	10			ENE	2	7.5	
5	70 23	2 30	S	5.6	53.9	8.7	8.1	96	Cust.	10			E	3	7.8	
6	70 23	2 30	SSE	4.7	54.5	8.2	7.9	98	Cust.	10			E	3	7.9	≡
7	70 22	2 14	SbE	5.6	54.4	8.0	7.9	99	Cust.	10			E	3	7.8	≡
8	70 22	2 14	SEbS	6.3	55.0	7.8	7.7	98	Cust.	10			E	3	7.8	≡●
9	70 22	2 14	SSE	5.0	55.2	8.0	8.0	00	Cust.	10	●°		ENE	2	7.8	
10	70 22	2 14	S	3.6	55.2	8.7	8.1	96	Cust.	10		1.5	E	1	7.8	
11	70 22	2 12	SbW	3.3	55.2	9.0	8.1	95	Cust.	10			ESE	1	8.0	
12	70 22	2 9	S	4.9	55.6	8.8	7.8	92	Cust.	10			E	1	8.2	
1 p.m.	70 22	2 6	SWbS	5.3	55.8	8.7	7.8	93	Cust.	10			E	2	8.2	
2	70 22	2 6	ESE	5.0	56.4	8.8	7.9	93	Cust.	10			E	2	8.1	⊙
3	70 22	2 6	E	3.8	56.3	8.7	7.8	93	Cust.	10			ENE	2	8.2	
4	70 22	2 6	SEbS	3.0	56.3	8.9	7.7	91	Cust.	10			ENE	2	8.0	
5	70 22	2 6	SEbS	2.8	56.5	9.0	7.8	92	Cust.	10			ENE	2	8.2	
6	70 25	1 50	ESE	3.8	56.6	9.2	8.0	92	Cust.	10			ESE	2	8.0	
7	70 27	1 30	SE	4.6	56.7	9.0	7.8	92	Cust.	10			ENE	2	8.0	
8	70 30	1 9	SE	4.6	56.5	9.1	7.7	91	Cust.	10			ENE	2	8.2	
9	70 33	0 49	SE	4.5	56.6	9.1	8.1	93	Cust.	10			ENE	2	8.4	
10	70 36	0 29	SEbS	5.3	56.7	8.6	7.9	95	Cust.	10			ENE	2	8.2	
11	70 38	0 9	EbS	3.8	56.7	8.4	7.8	94	Cust.	10			ENE	1	7.8	
12	70 39	0 0	SSW	5.0	56.7	8.4	7.8	94	Cust.	10			ENE	1	8.0	

1877. July 27.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1 a.m.	70° 40′	0° 2′ W	E$_b$S	3.6	756.7	8.2	7.9	98	Cust.	10			ENE	2	8.0	
2	70 42	0 21	E$_b$S	3.8	56.7	8.4	8.0	97	Cust.	10			ENE	2	7.8	
3	70 44	0 40	E$_b$S	3.7	56.7	8.3	8.0	98	Cust.	10	●°		ENE	2	7.9	
4	70 46	0 59	E$_b$S	3.8	56.7	8.1	7.7	96	Cust.	10	●°		ENE	2	7.4	
5	70 49	1 18	E$_b$S	3.8	56.9	8.2	7.9	98	Cust.	10	●°		ENE	2	7.4	
6	70 50	1 37	E$_b$S	3.7	56.9	8.4	8.0	97	Cust.	10	●°		ENE	2	7.4	
7	70 52	1 57	E$_b$S	3.7	56.9	8.6	8.1	98	Cust.	10			ENE	2	7.4	⊙
8	70 53	2 0	E$_b$N	4.2	57.2	8.2	7.9	98	Cust.	10			ENE	2	8.0	⊙
9	70 53	2 0	E$_b$N	4.8	57.3	8.3	7.8	96	Cust.	10			ENE	2	7.8	
10	70 53	2 0	E$_b$N	4.4	57.5	8.2	7.8	96	Cust.	10			ENE	2	7.8	≡ ●
11	70 54	2 9	ENE	6.1	57.7	8.2	7.7	94	Cust.	10			ENE	3	7.2	
12	70 56	2 29	ENE	6.3	57.6	8.2	7.7	94	Cust.	10			ENE	3	7.0	⊙
1 p.m.	70 57	2 55	ENE	6.1	57.6	9.2	7.5	88	Cust. Ci.	10			ENE	3	7.0	⊙
2	70 57	3 20	ENE	5.9	57.4	8.4	7.3	89	Cust.	10			ENE	3	6.6	
3	70 58	3 40	NE	4.6	57.7	7.8	7.2	92	Cust.	10			ENE	3	7.0	
4	70 58	3 47	NE	6.8	57.7	8.0	7.7	96	Cust.	10			ENE	3	7.0	
5	70 59	4 13	NE$_b$N	3.8	57.4	7.7	7.1	90	Cust.	10			ENE	3	8.0	
6	71 0	4 40	N$_b$E	3.1	57.6	6.5	6.5	90	Cust.	10			ENE	2	6.0	
7	71 0	5 8	NE	5.3	57.3	5.9	6.4	93	Cust.	10				2	4.6	
8	71 0	5 8	ENE	5.2	57.7	5.6	6.4	94	Cust. Cu.	10				3	4.6	⊙
9	71 0	5 8	NE$_b$E	5.0	57.3	5.2	6.4	97	Cust. Str. Cicu.	9				3	4.4	≡
10	71 1	5 34	NE$_b$E	5.5	57.1	4.8	6.2	97	Cust Cicu.	10				3	4.0	≡
11	71 1	6 0	E	1.4	57.2	4.6	6.1	97	Cust.	10				2	3.9	≡
12	71 1	6 0	E$_b$N	3.0	57.2	4.4	6.0	97	Cust.	10				2	3.6	≡
1877. July 28.																
1 a.m.	71 1	6 21 W	NE$_b$E	7.2	757.2	4.1	6.0	98	Cust.	10	●°		N	2	3.6	≡ ●
2	71 1	6 47	NE$_b$E	6.6	57.2	4.3	6.1	98	Cust.	10	●°		N	2	3.7	≡ ●
3	71 2	6 51	NE$_b$N	4.8	56.9	4.0	5.9	97	Cust.	10			N	2	3.8	
4	71 2	6 51	N$_b$E	3.8	56.8	3.8	5.9	98	Cust.	10			NNW	2	3.9	⊙
5	71 2	6 51	NE	4.3	57.0	3.7	5.9	98	Cust. Cicu.	10			NE	2	3.4	≡ ⊙
6	71 2	6 51	NNE	4.1	57.0	3.6	5.8	98	Cust.	10			NE	2	3.3	≡
7	71 2	6 51	NNE	3.7	57.0	3.8	5.8	97	Cust.	10	●°		NE	2	3.2	≡
8	71 2	6 51	N$_b$E	4.3	56.9	3.8	5.9	98	Cust.	10	●°		NE	2	3.4	7 a.m. to 2 p.m. Swell from SE.
9	71 2	7 2	NE$_b$N	6.8	56.8	4.0	5.9	97	Cust.	10	●°		NE	2	3.5	
10	71 2	7 26	N$_b$E	4.3	56.9	4.0	5.9	97	Cust.	10	≡	2.0	NE	2	3.0	
11	71 2	7 27	NE	6.5	56.6	4.0	5.9	97	Cust.	10	≡●°		NNE	2	3.2	
12	71 2	7 36	N$_b$W	3.1	57.1	4.4	6.0	97	Cust.	10	≡●°		NNE	2	3.6	
1 p.m.	71 2	7 47	N	5.8	57.0	4.5	6.2	98	Cust.	10	≡●°		NNE	2	3.6	
2	71 2	7 54	NW	3.0	57.1	4.6	6.2	98	Cust.	10	≡●°		NE	2	3.8	Made Jan Mayen.
3	71 2	7 54	N$_b$E	3.4	57.0	5.2	6.5	98	Cust.	10	≡●°		NE	2	3.8	
4	71 3	7 53	SW$_b$S	2.2	57.0	4.8	6.3	98	Cust.	10	≡		NE	2	3.6	Sailed
5	71 8	7 46	E$_b$N	5.4	56.8	4.0	5.9	97	Cust.	10	≡		NE	1	3.4	round
6	71 11	7 58	ENE	5.6	56.7	3.4	5.7	98	Cust.	10	≡		NNE	1	2.3	North
7	71 11	8 21	ENE	6.9	56.8	3.2	5.7	98	Cust.	10	≡		NNE	1	3.3	Part
8	71 11	8 33	ENE	5.5	56.8	3.6	5.8	98	Cust.	10	≡		NE	1	3.5	of
9	71 8	8 43	WSW	3.2	56.6	3.6	5.9	00	Cust.	10	≡		NNE	1	3.6	Jan Mayen.
10	71 3	8 36	S$_b$E	6.6	56.8	4.3	6.1	98	Cust.	10	≡		NNE	1	3.8	*b* in W.
11	71 0	8 29	NE$_b$N	2.6	55.9	4.0	5.9	97	Cust.	10			NW	1	3.6	{ Mary Muss Bay. West
12	71 0	8 29		0.0	56.2	3.9	6.0	98	Cust.	10			NW	1	3.7	{ Side of Jan Mayen.
1877. July 29.																
1 a.m.	71 0	8 29 W		0.0	755.9	4.2	6.0	97	Cust.	10	≡			0	3.7	
2	71 0	8 29		0.0	55.8	4.0	5.9	97	Cust.	10	≡			0	3.5	
3	71 0	8 29		0.0	55.6	4.0	6.0	98	Cust.	10	≡			0	3.6	
4	71 0	8 29		0.0	55.5	4.0	6.0	98	Cust.	10	≡			0	3.5	
5	71 0	8 29		0.0	55.4	4.1	6.0	98	Cust.	10				0	3.6	
6	71 0	8 29		0.0	55.5	4.7	6.0	94	Cust. Cist.	10				0	3.4	
7	71 0	8 29	N$_b$E	5.2	55.4	4.0	5.7	93	Cust.	10			N	1	3.6	
8	71 0	8 29		0.0	55.3	5.8	6.5	94	Cust.	10				0	3.6	
9	71 0	8 29	N$_b$E	3.6	55.5	4.1	5.7	93	Cust.	10			N	1	3.6	
10	71 0	8 29		0.0	55.6	4.7	6.1	96	Cust.	10			N	1	3.7	⊙
11	71 0	8 29		0.0	55.6	4.8	5.8	90	Cust.	10			N	1	4.0	
12	71 0	8 29		4.0	55.5	4.2	5.8	93	Cust.	10	≡		NNE	1	4.4	
1 p.m.	71 0	8 29		0.0	55.9	4.2	6.0	97	Cust.	10			NE	1	3.4	
2	71 0	8 29		0.0	55.7	5.8	6.3	91	Cust.	10			NE	0	4.0	
3	71 0	8 29		0.0	55.9	5.0	5.9	90	Cust.	10			NNE	0	4.0	
4	71 0	8 29		0.0	56.2	5.0	5.9	90	Cust.	10			NNE	0	3.2	
5	71 0	8 29	NNE	3.0	55.9	4.4	5.7	92	Cust.	10			N	1	3.5	
6	71 0	8 29	NNE	3.0	56.1	4.4	5.6	90	Cust.	10			N	1	3.4	
7	71 0	8 29	NNE	0.0	56.2	4.2	5.6	90	Cust.	10			N	1	3.2	
8	71 0	8 29		0.0	56.3	4.4	5.6	90	Cust.	10			N	1	3.4	
9	71 0	8 29	W	2.3	56.5	3.9	5.7	93	Cust.	10			NNW	1	3.8	
10	71 0	8 29	NE	2.6	56.5	3.7	5.6	93	Cust.	10			NNW	1	3.7	
11	71 0	8 29	NE	4.3	56.7	3.4	5.6	97	Cust.	10	≡		NE	1	3.5	
12	71 0	8 29	NE	4.7	56.9	3.2	5.6	97	Cust	10			NE	1	3.6	

1877. July 30.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	71° 0'	8° 29' W	NNE	4.6	757.1	3.2	5.6	97	Cust.	10			N	1	3.6	≡
2	71 0	8 29	NE	4.8	57.1	3.2	5.6	97	Cust.	10			N	1	3.8	≡
3	71 0	8 29	NEbN	3.8	57.0	3.2	5.6	97	Cust.	10			N	1	3.4	≡
4	71 0	8 29	NbE	4.0	57.1	3.4	5.5	95	Cust.	10			N	1	3.4	≡
5	71 0	8 29	NNW	3.6	57.2	3.3	5.6	97	Cust.	10			NNW	1	3.4	
6	71 0	8 29	NNW	3.7	57.7	3.4	5.5	95	Cust.	10			NNW	1	3.3	Elevated fog.
7	71 0	8 29	NW	2.6	58.0	3.4	5.5	95	Cust.	10			NNW	1	3.4	Elevated fog.
8	71 0	8 29	NW	4.0	58.0	3.4	5.5	95	Cust.	10			NNW	1	3.3	≡●
9	71 0	8 29	NW	3.9	57.6	3.4	5.5	95	Cust.	10			NNW	1	3.4	≡
10	71 0	8 29	NW	6.0	58.0	3.4	5.5	95	Cust.	10			NNW	1	3.6	≡
11	71 0	8 29	NWbW	5.8	58.0	3.2	5.5	95	Cust.	10			NNW	1	3.4	
12	71 0	8 29	NWbN	6.4	58.0	3.3	5.5	95	Cust.	10			NNW	1	3.3	
1p.m.	71 0	8 29	NWbN	7.0	58.0	3.6	5.5	93	Cust.	10			NNW	1	3.2	
2	71 0	8 29	NW	6.2	57.6	3.2	5.4	93	Cust.	10			N	1	3.2	
3	71 0	8 29	NWbN	7.0	57.4	3.2	5.2	90	Cust.	10			NNW	1	3.4	
4	71 0	8 29	NW	8.4	57.0	2.8	5.0	89	Cust.	10			N	2	3.0	
5	71 0	8 29	NWbW	8.6	56.7	3.2	4.6	80	Cust.	10			NNW	2	3.0	⊙ Weighed and sailed
6	71 3	8 32	NNW	5.0	56.6	2.6	5.1	93	Str. Ci.	9			NW	1	3.3	N. thwards round Jan Mayen.
7	71 7	8 26	NW	8.2	56.4	2.4	5.1	93	Cust.	9			NNW	2	3.6	*b* in NW.
8	71 10	8 8	NWbN	5.6	56.1	2.0	4.9	93	Cust.	10			NE	4	3.5	Lover parts of the land
9	71 10	7 48	N	9.6	55.6	1.4	4.9	96	Cust.	10			NNE	4	2.8	visible up to 100ᵐ.
10	71 3	7 46	NbW	9.8	55.2	1.4	4.9	96	Cust.	10			NNW	3	4.0	
11	70 59	7 54	NNE	6.3	55.3	1.6	4.9	94	Cust.	10			N	2	3.4	
12	70 57	8 14	NbE	9.3	55.6	1.6	4.8	93	Cust.	10			NNE	2	2.8	

1877. July 31.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	70 58	8 25 W	N	7.2	755.5	1.2	4.8	96	Cust.	10			NNE	1	2.0	≡● Great Wood Bay. E. Side
2	70 58	8 25	NbW	7.4	55.1	1.4	4.9	96	Cust.	10			NNE	1	2.2	≡● of Jan Mayen.
3	70 58	8 25	N	7.2	55.1	1.4	4.9	96	Cust.	10			N	1	2.0	≡●
4	70 58	8 25	N	8.8	55.5	1.4	4.9	96	Cust.	10			N	1	2.2	≡●
5	70 58	8 25	NbW	6.6	55.3	2.1	5.1	94	Cust.	10			SW	1	2.2	≡●
6	70 58	8 25	NbW	7.8	55.4	2.2	5.2	96	Cust.	10			SW	1	2.1	≡●
7	70 58	8 25	NbW	7.6	55.6	2.6	5.3	96	Cust.	10			SW	1	2.0	≡●
8	70 58	8 25	NbW	7.5	55.5	2.4	5.4	98	Cust.	10			SW	1	2.0	≡●
9	70 58	8 25	NbW	7.9	55.6	3.2	5.5	95	Cust.	10			N	1	3.0	
10	70 58	8 25	N	3.7	55.6	3.8	5.6	93	Cust.	10			N	1	3.3	⊙
11	70 58	8 25		0.0	56.0	4.6	5.7	90	Cust.	10			N	1	3.4	⊙
12	70 58	8 25	WSW	3.6	56.0	4.6	5.5	87	Cust.	10			SSW	1	3.4	⊙
1p.m.	70 58	8 25	SEbS	5.0	56.2	5.0	5.7	87	Cust.	10			SSW	1	3.2	⊙
2	70 58	8 25	WbS	6.2	56.2	4.0	5.3	87	Cust.	10			SSW	1	3.2	⊙
3	70 58	8 25	NEbN	5.6	56.1	5.0	5.3	81	Cust.	10			S	1	3.4	
4	70 58	8 25	WbS	3.6	56.4	5.0	5.3	81	Cust.	10			SW	1	3.4	
5	70 58	8 25	WbS	3.6	56.4	4.8	6.0	94	Cust.	10			SW	1	3.2	
6	70 58	8 25	SSE	5.0	56.6	3.8	6.0	00	Cust.	10			SSW	1	3.4	
7	70 58	8 25	NbW	8.8	56.5	3.4	5.7	98	Cust.	10			S	1	3.4	
8	70 58	8 25	NbW	4.0	56.6	3.4	5.1	87	Cust.	10			N	1	3.4	
9	70 58	8 25	NbW	7.4	56.6	3.0	4.9	87	Cust.	10			N	1	3.4	
10	70 58	8 25	N	8.0	56.7	2.5	4.8	87	Cust.	10			N	1	3.4	
11	70 58	8 25	NbE	8.4	56.5	2.4	4.8	87	Cust.	10			N	1	3.4	
12	70 58	8 25	NbE	8.5	56.5	2.2	4.6	85	Cust.	10			N	1	3.4	

1877. August 1.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	70 58	8 25 W	NbE	8.0	756.6	2.0	4.5	95	Cust.	10			N	1	2.0	Great Wood Bay.
2	70 58	8 25	N	8.4	56.5	1.6	4.6	89	Cust.	10			N	1	2.0	E. Side of Jan Mayen.
3	70 58	8 25	N	8.1	56.5	1.4	4.7	93	Cust.	10			N	1	2.0	
4	70 58	8 25	N	8.4	56.2	1.2	4.8	96	Cust.	10			N	1	2.2	
5	70 58	8 25	NbW	9.2	55.6	1.4	4.8	94	Cust.	10			SE	1	2.8	Elevated fog.
6	70 58	8 25	NbW	10.6	55.7	1.4	4.9	96	Cust.	10			SE	1	2.8	Elevated fog.
7	70 58	8 25	NbW	11.0	55.7	1.6	4.9	94	Cust.	10			SE	1	2.6	Elevated fog.
8	70 58	8 25	NbW	8.7	56.1	1.8	5.1	96	Cust. Cist.	9			SSE	1	2.6	Elevated fog.
9	70 58	8 25	NbW	9.0	55.8	2.1	5.1	94	Cust. Cu.	9			SSE	1	2.7	Elevated fog.
10	70 58	8 25	NbW	8.0	55.7	2.2	5.1	94	Cust. Cu.	10			SSE	1	2.6	
11	70 54	8 25	N	9.0	55.8	3.2	5.6	97	Cust.	10			SE	1	3.5	⊙
12	70 54	8 25	NbE	8.4	55.5	4.2	5.4	87	Cu. Cicu.	8			SSE	1	4.2	
1p.m.	70 54	8 24	NNW	11.6	55.6	4.2	5.4	87	Cu. Cicu.	8			NE	1	3.4	
2	70 53	8 23	N	12.8	55.6	4.2	5.2	84	Cu. Cicu.	8			N	1	3.2	Weighed.
3	70 53	8 23	N	16.0	55.2	4.2	5.0	80	Cu. Ci.	8			N	1	3.2	
4	70 52	8 22	NW	15.0	55.0	5.0	4.7	72	Cu. Ci.	6			NNE	1	3.2	
5	70 52	8 21	NW	8.0	55.2	5.2	4.8	72	Cu. Ci.	6			NNE	2	3.4	
6	70 51	8 20	NEbE	10.0	55.4	4.5	4.7	74	Cu. Ci.	6			NE	4	3.4	
7	70 51	8 20	W	8.6	56.2	4.2	4.6	74	Cu. Ci.	6			NE	3	3.4	
8	70 53	8 24	NW	4.2	56.6	3.7	4.5	75	Cust. Cu. Ci.	6			WNW	3	3.4	
9	70 57	8 31	NEbN	12.4	55.9	3.4	4.4	75	Cust.	8			NE	2	3.4	Great Wood Bay.
10	70 57	8 31	NEbN	7.0	56.0	3.2	4.6	80	Cust.	10			NE	1	2.4	E. Side of Jan Mayen.
11	70 57	8 31	NEbN	6.4	56.1	3.1	4.5	79	Cust.	10 ●⁰			NE	1	2.5	
12	70 57	8 31	NEbN	14.7	56.2	2.2	4.9	91	Cust.	10 ●⁰			NE	2	2.2	

1877. August 5.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	68° 53′	11° 13′ W	NbW	2.6	758.2	2.2	5.2	96	Cust.	10			E		4.2	≡
2	68 53	11 12	NbW	2.6	58.4	2.4	5.3	96	Cust.	10			E		4.4	
3	68 52	11 11	NbW	1.8	58.5	2.4	5.3	96	Cust.	10			E		4.6	
4	68 51	11 10		0.0	58.5	2.8	5.2	93	Cust.	10			E		4.2	
5	68 50	11 9		0.0	58.6	2.4	5.3	96	Cust.	10			N		4.4	5 a.m. to noon Swell from W.
6	68 49	11 7		0.0	58.5	2.2	5.2	96	Cust.	10			N		4.4	
7	68 48	11 6		0.0	58.5	2.3	5.2	96	Cust.	10			NNE		4.4	
8	68 47	11 4	NEbE	2.6	58.4	2.8	5.4	96	Cust.	10			N		4.5	
9	68 46	11 3	NNE	1.8	58.3	3.2	5.4	93	Cust.	10			N		4.6	
10	68 46	11 2	NEbN	0.0	58.2	3.4	5.4	93	Cust.	10			NNE		4.6	
11	68 45	11 0	EbN	0.0	58.6	3.8	5.4	90	Cust.	10			NNE		4.6	
12	68 44	11 0	ENE	3.8	58.9	4.0	5.3	87	Cust.	10			ENE		4.8	
1p.m.	68 44	10 59	NEbE	0.0	59.0	4.4	5.0	80	Cust.	10			NE		5.0	
2	68 43	10 58		0.0	59.0	4.6	5.5	87	Cust.	10			NNE		5.0	
3	68 43	10 57	NNE	4.0	59.2	4.4	5.4	87	Cust.	10			NNE		5.0	
4	68 42	10 56	NNE	6.4	59.0	4.2	5.4	87	Cust.	10			NE		5.0	
5	68 42	10 55	NNE	6.7	59.1	4.1	5.8	95	Cust.	10			NE		4.8	≡ ●
6	68 41	10 55	NNE	6.7	58.8	3.8	5.8	97	Cust.	10			NE		4.6	≡ ●
7	68 41	10 54	NNE	6.7	59.0	3.8	5.7	95	Cust.	10			NE		4.6	≡ ●
8	68 41	10 54	NE	3.2	58.9	3.9	5.7	93	Cust.	10			ENE		4.6	
9	68 41	10 47	NNE	8.8	58.6	3.8	5.6	93	Cust.	10			NE		4.6	≡ ●°
10	68 40	10 28	NEbN	9.0	58.5	3.9	5.7	95	Cust.	10			NE		4.6	
11	68 39	10 8	NEbN	9.5	58.4	4.4	5.9	96	Cust.	10			NE		5.0	
12	68 39	9 49	NEbE	7.7	58.3	4.4	5.4	87	Cust.	10			NE		5.0	

1877. August 6.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	68 38	9 29 W	NEbE	0.6	758.6	4.4	5.4	87	Cust.	10			NE	1	5.2	≡
2	68 37	9 9	NEbE	0.5	58.6	4.6	5.9	94	Cust.	10			NE	1	5.4	≡
3	68 36	8 49	SEbE	0.3	58.2	4.8	6.2	97	Cust.	10			NE	1	4.8	≡
4	68 36	8 40	E	3.6	58.1	3.4	5.6	97	Cust.	10			NNE	1	5.0	
5	68 36	8 40		0.0	58.5	3.8	5.6	93	Cust.	10			NNE	1	5.6	
6	68 35	8 23	EbS	0.2	58.6	3.6	5.6	95	Cust.	10			NE	1	5.7	≡ ●
7	68 35	8 3	EbS	0.9	58.5	3.2	5.3	92	Cust.	10			NE	1	5.6	≡ ●
8	68 34	7 44	NEbN	1.9	58.7	3.5	5.3	90	Cust.	10			NE	1	6.3	Swell from SSW.
9	68 33	7 25	NWbW	0.8	58.4	4.0	5.1	84	Cust.	10			NE	1	6.0	Swell from SSW.
10	68 32	7 5	WSW	5.0	58.7	4.8	5.4	84	Cust.	10			WSW	1	6.6	
11	68 31	6 46	WbS	7.0	59.0	5.2	6.1	92	Cust.	10			WSW	1	7.5	⊙
12	68 31	6 28	W	3.8	59.0	5.2	5.6	84	Cust. Cu.	10			W	1	7.8	Clears up.
1p.m.	68 32	6 27	W	8.0	59.3	5.4	5.7	85	Cust. Cu.	10			W	1	7.2	Water blue.
2	68 32	6 27	WSW	8.2	59.2	5.4	5.5	82	Cust. Cu.	10			WSW	1	7.2	
3	68 32	6 7	WbS	7.8	59.4	5.4	5.5	82	Cust. Cu.	10			WSW	1	7.2	
4	68 31	5 47	WbS	6.1	59.5	5.0	5.9	90	Cust. Cu.	10			WSW	1	7.4	
5	68 30	5 27	SWbW	6.0	59.8	5.2	5.6	84	Cust. Cu.	10			WSW	1	7.9	⊙
6	68 30	5 8	SWbW	5.6	59.7	5.4	5.9	87	Cust.	10			WSW	1	8.2	
7	68 29	4 48	SWbW	7.1	59.6	5.4	6.1	91	Cust.	10			SW	1	8.2	≡
8	68 28	4 28	WbS	7.5	59.7	5.2	6.2	94	Cust.	10			SW	1	8.3	≡
9	68 28	4 17	SWbW	8.6	59.2	5.6	5.8	85	Cust.	10			SW	3	8.0	
10	68 28	4 17	SWbW	8.1	60.0	5.2	5.8	87	Cust.	10			SW	3	8.4	
11	68 27	4 3	W	8.7	60.0	5.6	5.5	82	Cust.	10			WSW	3	8.4	
12	68 26	3 43	W	9.1	60.1	5.8	5.8	85	Cust.	10			WSW	3	8.4	

1877. August 7.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	68 25	3 23 W	WbS	8.6	759.8	5.8	5.8	85	Cust.	10			WSW	2	8.4	≡
2	68 24	3 4	WbS	8.4	59.7	5.6	5.8	85	Cust.	10			WSW	2	8.2	≡
3	68 23	2 45	WbS	9.2	59.8	7.0	5.8	77	Cust.	10			SW	2	7.2	≡
4	68 22	2 26	WbS	9.4	60.0	7.4	5.5	72	Cust.	10			SW	2	8.0	
5	68 21	2 5	WbS	9.4	60.3	7.0	6.4	85	Cust.	10			SW	2	9.0	≡ ●
6	68 21	2 5	WSW	7.2	60.2	7.4	5.7	74	Cust.	10			WSW	2	9.0	
7	68 21	2 5	WSW	5.2	60.3	6.9	6.3	84	Cust.	10			WSW	2	9.0	
8	68 21	2 5	SWbS	3.2	60.1	7.0	5.3	71	Cust. Cu.	10			WSW	1	9.0	⊙
9	68 20	1 47	SWbS	7.6	59.9	8.0	6.4	81	Cust.	10			SW	2	9.2	
10	68 19	1 29	SSW	7.9	60.0	8.3	6.4	78	Cust.	10			SW	2	8.8	⊙
11	68 17	1 10	SSW	8.5	59.9	8.2	7.7	94	Cust.	10			SSW	3	9.0	⊙
12	68 16	0 51	SSW	9.3	60.0	8.5	6.0	79	Cust.	10			SSW	3	9.0	⊙
1p.m.	68 15	0 31	SSW	6.4	59.6	7.8	7.0	89	Cust.	10	●°		SSW	2	8.4	⊙
2	68 15	0 12 W	SSW	5.0	60.0	8.4	6.9	84	Cust.	10			SSW	2	8.4	⊙
3	68 14	0 6 E	SbW	6.6	59.9	9.4	7.3	84	Cust.	10			SSW	2	9.0	⊙
4	68 14	0 6	SSE	5.6	60.1	9.2	7.3	84	Cust.	10			SW	2	9.2	⊙
5	68 14	0 16	SbW	7.6	60.0	9.8	7.3	82	Cust.	10			S	2	10.3	
6	68 13	0 36	SbW	7.8	59.8	10.0	6.8	74	Cust. Cicu.	10			S	2	10.2	
7	68 11	0 56	SbW	8.3	59.9	10.0	6.9	75	Cust. Cu.	10			S	2	10.0	
8	68 10	1 15	SbW	8.0	59.9	9.6	7.4	84	Cust. Cu.	10			S	2	9.6	
9	68 9	1 35	SbW	10.6	59.9	9.8	7.7	86	Cust. Cu.	10			SE	3	9.8	
10	68 8	1 53	SbE	7.7	60.0	9.6	6.8	76	Cust.	10			SE	3	9.8	
11	68 6	2 11	SbE	6.3	60.0	9.8	6.8	75	Cust.	10			SE	3	9.8	
12	68 5	2 24 E	SbE	6.6	60.2	9.9	6.9	75	Cust.	10			SSE	3	9.4	

1877. August 11.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	Ørsnes.			0.0	763.7	15.0	8.4	66	Ci.	2				0	14.4	
2				0.0	63.9	16.2	8.7	63	Ci.	2				0	15.0	
3				0.0	64.4	14.8	9.8	78	Ci.	2				0	14.0	
4				0.0	64.4	14.8	9.3	74	Ci.	2				0	14.0	
5				0.0	64.8	18.0	9.8	63	Ci.	1				0	14.2	
6				0.0	65.2	18.2	10.2	65	Ci.	1				0	14.8	
7			S b W	2.9	65.3	18.4	9.2	59		0				0	14.5	
8				0.0	65.6	18.9	9.2	57		0				0	14.8	
9			N b E	2.7	65.7	18.9	9.2	57	Ci.	0				0	14.6	
10			NW b W	3.5	65.9	17.0	10.6	74	Ci.	0				0	14.4	
11	68° 4′	14° 45′ E	NW	2.4	65.9	18.8	10.7	66	Ci.	0				0	14.6	Vestfjord.
12	68 4	14 45	N	3.0	65.9	19.0	11.1	68	Ci.	0			WSW	1	14.0	
1p.m.	68 4	14 45	N b W	2.8	65.8	19.0	10.8	66	Ci.	0			WSW	1	14.2	
2	68 4	14 45		0.0	65.8	18.4	9.5	60	Ci.	0			SW	1	15.8	
3	68 4	14 45	N b W	1.2	66.1	18.8	8.4	52	Ci.	0				0	16.4	
4	68 4	14 45	NE	3.5	66.1	19.6	9.1	53	Ci.	0				0	15.2	
5	67 58	14 35	NNE	3.7	66.6	18.1	10.8	70	Cist.	0			WSW	1	14.6	
6	67 51	14 27	ENE	5.7	66.9	17.3	10.0	68	Ci.	0			SW	1	14.3	
7	67 45	14 19	NNE	5.8	66.6	16.4	10.6	73	Ci.	0			SW	1	13.7	
8	67 38	14 14	NE	5.7	66.7	15.9	9.7	72	Ci.	0			SW	1	13.8	
9	67 31	14 19	ENE	1.8	67.0	14.8	9.8	78	Ci.	0			NE	1	12.8	
10	67 27	14 27	E b N	3.7	66.4	15.6	9.1	68	Ci.	0				0	12.6	
11	67 19	14 21	E b S	5.7	66.2	16.0	8.3	61	Ci.	0				0	10.6	
12	Bodø.		SE b S	4.6	66.3	15.6	8.3	62	Ci.	0				0	11.6	
1877. June 24.																
8a.m.	Bodø.		W b N	3.5	745.3	7.2	6.1	80	Cust.	10	●		W	1	7.4	
2p.m.			W b N	4.3	45.8	7.4	5.8	76	Cust.	10	●		W	1	7.5	
8			W b N	7.3	49.0	7.1	5.8	77	Cust.	10	●		W	1	7.4	
1877. June 25.																
8a.m.	Bodø.		SW b W	2.6	752.5	7.6	5.4	68	Cust.	8	●°		SW	1	7.5	ϙ ⊙
2p.m.	Hopen.		SW b W	4.0	53.5	9.9	6.0	65	Cust.	8			SW	1	8.0	
8	Salten Fjord.		SW b W	9.2	54.2	7.1	6.1	80	Cust.	8			SW	1	7.2	●
12	Vestfjorden.		W	6.4	52.7	7.8	6.4	81	Cu.	8			SW	1	8.8	
1877. June 26.																
2a.m.	Vestfjorden.		SW b W	7.6	750.9	8.0	4.7	59	Cust.	8			SW	2	8.2	
8	Røst.		ESE	4.0	50.6	8.9	6.6	77	Cu. Ci.	8			S	1	7.2	
2p.m.			E b N	6.6	50.6	9.0	6.5	76	Cu.	8			E	2	8.9	
8			E b N	6.4	49.2	8.9	6.3	74	Cu.	8			E	2	8.8	
1877. June 27.																
8a.m.	Røst.		WNW	4.2	748.6	10.5	7.7	81	Ci.	5				0	7.8	
2p.m.			W b N	4.0	50.3	10.0	7.8	86	Ci.	5				0	7.9	
8			W	4.2	52.3	9.8	7.6	84	Cu.	5				0	7.7	
1877. July 1.																
8a.m.	Sortland.		S	3.1	754.8	11.0	7.2	74	Cu. Ci.	6				0	8.8	
2p.m.			SW b W	7.8	55.1	11.9	7.1	68	Cust.	8			SW	4	10.5	
8			SW b W	5.6	55.1	9.2	7.6	89	Str.	7	●°		SW	4	9.0	●° ϙ.
1877. July 9.																
8a.m.	Tromsø.		NE b E	4.1	753.5	7.2	6.3	83	Cust. Cu.	8			NE	1	6.5	
2p.m.			NE b N	5.0	55.6	7.7	5.8	73	Cust.	10			NE	1	6.4	
8			ENE	2.8	57.7	6.9	5.5	74	Cust.	10				0	6.3	
1877. July 10.																
8a.m.	Tromsø.			0.0	759.7	5.5	6.0	89	Cust.	10	●°			0	6.2	
2p.m.				0.0	59.9	6.1	6.0	86	Cust.	10	●°			0	6.0	
8			NE	3.1	59.8	6.4	5.9	83	Cu.	8				0	6.5	

1878. June 27.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1 a.m.	Vardø.															
2																
3																
4																
5																
6																
7																
8																
9																
10																
11	70° 36′	32° 35′ E	S	4.9	758.5	7.4			Str.	10	●°≡°		NE	2	6.4	⊙
12	70 36	32 35	SbW	4.3	59.2	7.4	7.2	94	Cust.	10	●		NNE	2	6.4	
1 p.m.	70 35	32 42	SW	7.6	57.9	7.4	7.5	98	Cust.	10	●		NNE	2	6.4	Water blue.
2	70 34	32 56	SW	6.5	56.7	7.7	7.7	99	Cust.	10	●			1	6.3	
3	70 37	33 19	SWbS	9.0	56.1	8.2	7.9	98	Cust.	10	●°			3	6.5	
4	70 40	33 42	SWbS	8.9	55.3	8.2	7.9	98	Cust.	10	●°		SSW	3	6.4	
5	70 43	34 0	SWbS	8.2	54.6	8.6	7.9	95	Cust.	10			SSW	3	5.6	
6	70 45	34 14	WSW	8.5	54.3	8.8	7.8	92	Cust.	10		3.0	SSW	3	6.0	⊙
7	70 48	34 37	WbS	6.8	54.0	8.0	7.5	93	Cust.	10			SSW	3	5.4	
8	70 50	34 56	WbN	7.6	53.4	7.7	7.5	96	Cust.	10			SSW	3	5.5	⊙
9	70 53	35 18	WbN	7.6	53.0	7.0	7.3	98	Cust.	10			W	3	5.2	
10	70 56	35 37	NW	10.8	52.1	6.6	7.1	98	Cust.	10			W	4	5.2	
11	70 59	35 54	WbN	11.5	51.6	6.6	6.6	91	Cust.	10			WNW	5	5.2	
12	71 2	36 12	WbN	11.3	51.1	6.6	6.9	94	Cust.	10			WNW	6	5.3	

1878. June 28.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1 a.m.	71 3	36 21 E	WNW	12.7	749.4	7.4	6.6	86	Cust.	10			WNW	7	5.2	
2	71 4	36 17	WNW	14.2	48.5	7.4	6.6	86	Cust.	10			WNW	7	5.2	
3	71 4	36 12	WNW	15.1	47.9	7.0	6.4	85	Cust.	9			WNW	7	5.2	
4	71 5	36 8	WNW	14.4	46.8	6.2	6.2	88	Cust.	10			WNW	7	5.2	⊙
5	71 5	36 5	WNW	15.3	46.4	5.2	6.3	95	Cust.	10			WNW	7	5.1	
6	71 5	36 2	WNW	14.8	46.1	5.0	6.3	97	Cust.	10	●		WNW	7	5.0	
7	71 6	36 0	WNW	12.6	46.4	5.4	6.3	94	Cust.	10	●		WNW	7	5.0	
8	71 6	35 58	WNW	14.7	47.5	5.2	6.0	90	Cust.	10	●°		WNW	7	5.0	
9	71 6	35 53	NWbW	14.4	49.1	4.4	5.5	89	Cust.	10	●°		WNW	8	5.2	
10	71 6	35 50	NWbW	13.0	50.2	4.6	5.5	87	Cust.	10			NW	8	4.9	
11	71 6	35 46	NWbW	11.0	51.1	4.6	5.3	84	Cust.	10			NW	8	4.8	
12	71 7	35 43	NW	11.4	53.0	4.4	5.4	87	Cust.	10			NW	7	5.0	⊙
1 p.m.	71 7	35 39	NNW	13.5	53.9	4.6	5.3	84	Cust.	10			NW	7	4.9	
2	71 7	35 35	NWbN	10.9	55.0	4.4	5.0	80	Cust.	9			NW	6	5.0	⊙
3	71 7	35 32	NWbN	13.0	55.2	4.3	4.9	79	Cust.	10			NW	6	5.0	⊙
4	71 8	35 29	NWbN	11.0	55.2	4.6	4.9	78	Cust.	10			NW	6	5.0	⊙
5	71 8	35 26	NWbN	9.7	55.2	4.7	5.0	78	Cust.	10			NW	6	4.9	
6	71 8	35 22	NW	12.8	55.1	4.5	5.0	79	Cust.	10			NW	6	5.0	
7	71 9	35 19	NW	8.4	54.9	4.6	5.0	79	Cust.	10	●°	0.2	NW	5	5.0	
8	71 9	35 15	NWbN	8.1	54.8	4.3	4.9	79	Cust.	10			NW	5	5.0	
9	71 12	35 6	NWbN	7.3	55.2	3.8	5.2	87	Cust.	10	✱°		NNW	4	4.9	
10	71 15	34 56	NNW	7.8	55.0	4.4	5.1	82	Cust.	10			NNW	3	4.9	⊙
11	71 18	34 54	WNW	14.6	55.0	3.0	4.9	87	Cust.	10			NW	3	4.6	⊙
12	71 21	35 9	WNW	12.8	55.3	2.8	4.7	84	Cust. Cu.	5	✱°		NW	3	4.6	⊙

1878. June 29.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1 a.m.	71° 24′	35° 25′ E	NWbW	11.5	754.9	3.0	4.5	79	Str.	8			NW	3	4.6	⊙
2	71 26	35 38	NWbW	12.5	54.6	3.0	4.3	76	Cust.	10			NNW	3	4.6	
3	71 27	35 42	NWbW	9.8	54.1	3.5	4.6	78	Cust.	9			NNW	3	4.6	
4	71 30	35 59	NWbW	11.3	53.8	2.8	4.9	88	Cust.	10	●°		NNW	3	4.4	
5	71 33	36 16	NWbW	11.9	52.9	3.2	4.8	83	Cust. Cu.	3			NNW	3	4.6	
6	71 36	36 33	NWbW	12.7	52.8	3.5	4.8	82	Cust.	10			NNW	4	4.5	⊙ from 4½ to 5; ●° at 4½.
7	71 40	36 51	NWbW	13.7	52.2	3.8	5.2	87	Cust.	10			NNW	5	4.0	
8	71 42	37 1	NWbN	9.2	52.0	4.2	5.2	85	Cust.	10			NNW	4	4.2	
9	71 42	37 1	NW	9.1	51.9	4.3	5.3	85	Cust.	10			NW	4	4.2	
10	71 42	36 58	NW	9.0	51.9	4.6	5.3	84	Str.	9			NW	4	3.9	
11	71 40	36 45	NWbW	9.7	52.3	4.8	5.4	84	Str.	2			NW	4	4.0	
12	71 39	36 36	NWbW	13.0	52.1	4.8	5.5	86	Str.	0			NW	5	4.4	⊙
1 p.m.	71 38	36 26	NWbW	12.2	52.5	4.8	5.6	87	Str.	0			WNW	4	4.0	
2	71 36	36 18	WbN	9.5	52.8	5.0	5.7	87	Str.	0			WNW	4	4.4	
3	71 36	36 18	W	12.8	52.6	4.8	5.6	87	Str.	0			WNW	4	4.7	
4	71 41	36 21	WbN	12.0	52.1	4.4	5.8	93	Str.	0			WNW	5	4.6	
5	71 46	36 24	WbN	11.7	51.7	4.4	5.6	90	Str.	0			WNW	5	4.4	
6	71 51	36 27	WNW	9.3	50.8	4.4	5.8	93	Cust. Str. Ci.	0			NW	5	4.2	
7	71 56	36 30	WNW	12.9	50.1	4.4	5.8	93	Cust. Str. Ci.	0			NW	5	4.2	
8	72 1	36 33	W	12.3	49.5	3.9	5.7	95	Cust. Str. Ci.	0			NW	5	3.2	
9	72 7	36 37	W	9.9	48.7	3.4	5.6	97	Cust. Str. Ci.	0			NW	5	2.4	m horiz.
10	72 10	36 39	W	9.2	48.4	3.2	5.5	95	Ci.	0			NW	5	2.2	Water blue.
11	72 11	36 40	NWbW	8.5	48.0	3.0	5.3	93	Cust.	10			WNW	4	2.0	
12	72 13	36 30	WNW	6.7	47.6	3.2	5.2	90	Cust.	10			WNW	4	2.1	

1878. July 3.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	74° 3′	25° 35′ E	W$_b$N	12.1	752.8	3.2	5.2	90	Cust.	10			WNW	5	4.0	
2	74 2	25 21	W$_b$N	8.7	52.8	3.2	5.2	90	Cust.	10			WNW	5	3.8	
3	74 2	25 6	W$_b$N	10.0	52.2	3.0	5.3	93	Cust.	10			WNW	5	4.0	
4	74 1	24 51	WNW	12.3	52.2	2.8	5.2	93	Cust.	10			WNW	5	3.9	
5	74 1	24 42	WNW	13.9	51.9	3.1	5.1	90	Cust.	10			WNW	5	4.0	⊙
6	74 1	24 29	NW	12.9	51.7	2.4	5.1	93	Cust.	10			WNW	5	4.0	/
7	74 1	24 19	NW$_b$W	11.0	51.1	2.6	5.3	96	Cust.	10			WNW	5	4.0	/
8	74 1	24 8	NW$_b$W	10.4	51.5	2.8	5.0	89	Cust.	10			WNW	5	4.0	
9	74 1	23 57	WNW	10.6	51.7	3.0	5.1	90	Cust.	10			WNW	5	4.2	
10	74 0	23 49	WNW	12.1	51.7	2.8	5.0	89	Cust.	10			WNW	5	4.2	
11	74 0	23 38	WNW	12.4	51.8	2.6	4.9	89	Cust.	10			WNW	5	4.1	
12	74 0	23 26	NW$_b$W	11.6	52.2	2.4	4.9	89	Cust.	10			WNW	5	3.8	⊙
1p.m.	74 0	23 17	NW	9.2	52.0	2.3	4.9	91	Cust.	10			WNW	5	3.7	⊙
2	74 0	23 5	NW	8.3	52.0	2.6	4.9	89	Cust.	10			WNW	4	3.7	
3	74 0	22 53	NW$_b$W	9.7	51.9	3.0	5.1	90	Cust.	10			WNW	4	4.4	
4	74 0	22 41	NW$_b$W	9.5	51.9	3.2	5.1	89	Cust.	10			WNW	3	4.7	⊙
5	74 1	22 27	WNW	10.4	51.9	3.2	5.0	87	Cust.	10			WNW	3	4.2	
6	74 3	22 15	WNW	9.8	52.0	2.3	4.9	89	Cust.	10			WNW	3	4.2	Water bluish green.
7	74 6	22 0	WNW	6.5	52.0	2.4	5.0	91	Cust.	10			WNW	3	4.4	⊙
8	74 8	21 44	WNW	6.8	51.9	1.6	5.0	96	Cust.	10			WNW	3	3.8	
9	74 10	21 24	WNW	6.5	51.8	1.3	4.9	98	Cust.	10			WNW	3	3.2	≡ at 9^h 30^m; some pieces of ice.
10	74 13	21 5	WNW	6.2	52.0	1.4	4.9	96	Cust.	10			WNW	3	3.6	Water more yellowish.
11	74 15	20 46	WNW	5.9	51.9	1.8	5.1	96	Cust.	10			WNW	2	2.4	Floating ice round the whole horizon.
12	74 16	20 30	WNW	5.9	51.8	2.2	5.2	96	Cust.	10			WNW	2	2.0	

1878. July 4.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	74 18	20 8 E	WNW	5.3	751.4	2.1	5.2	98	Cust.	10			WNW	2	1.7	⊙
2	74 20	19 44	WNW	5.4	51.3	3.1	5.0	88	Cust.	8			WNW	2	1.8	
3	74 21	19 29	WNW	7.0	50.9	4.4	4.8	77	Cust. Cu. Ci.	5			WNW	1	1.9	
4	74 20	19 23	WSW	3.4	50.6	4.0	5.1	84	Cust. Ci.	5			WSW	1	2.0	
5	74 20	19 23	W$_b$N	9.1	50.7	3.6	5.3	90	Ci. Cu.	6			W	1	1.8	
6	Beeren-Eiland		NW	3.2	50.9	3.4	5.4	93	Ci.	4			NW	1	1.8	
7	South East Side.		SW	2.1	51.1	4.5	5.6	89	Ci. Cu.	4			WNW	1	2.0	
8			SW	1.9	51.3	5.4	5.5	82	Ci. Cust.	3			NW	1	1.8	
9			W	6.9	51.0	4.5	5.4	86	Cust. Ci.	4			WNW	1	1.8	
10			NNW	8.2	50.8	4.9	5.5	84	Cust. Ci.	4			W	1	1.9	
11			NW$_b$W	8.6	50.9	4.4	5.2	84	Cust. Ci.	4			NW	1	2.1	
12			NW$_b$W	7.0	51.2	5.0	5.1	78	Cust. Ci.	6			WNW	1	2.2	
1p.m.			NW$_b$W	6.6	51.3	5.4	4.8	72	Cust. Ci.	6			WNW	1	2.1	
2			WNW	5.5	51.5	5.4	5.3	78	Cust. Ci.	6			WNW	1	2.2	
3			NW	4.7	52.0	6.4	5.3	73	Ci.	3			W	1	2.1	
4			NW	4.6	52.4	5.9	5.4	78	Cust. Ci.	5			NW	1	2.1	
5	Beeren-Eiland.		SW	1.7	52.4	3.9	5.3	87	Cust. Ci.	7				0	2.0	
6	74 17	19 14	W$_b$S	2.0	52.4	3.4	5.4	93	Cust.	8				0	1.8	
7	74 10	18 51		0.0	52.0	3.6	5.7	97	Cust.	9				0	1.2	
8	74 10	18 51	SW$_b$W	2.2	52.1	3.4	5.4	93	Cust.	10				0	1.4	
9	74 9	18 31	SW$_b$S	2.1	52.1	3.0	5.3	93	Cust.	10			NNW	1	1.4	
10	74 7	18 5	SW$_b$S	2.2	51.9	4.4	5.8	93	Cust.	10			NNW	1	4.4	
11	74 4	17 41	S	3.6	51.7	4.7	5.9	92	Cust.	10			NNW	1	4.7	
12	74 3	17 18	SE$_b$S	3.9	51.6	4.6	5.9	94	Cust.	10			WNW	1	4.6	

1878. July 5.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	74 2	17 10 E	E	1.4	751.5	4.8	6.0	94	Cust.	10					5.4	
2	74 0	16 46	SSE	1.0	50.9	5.2	5.7	86	Cust.	10					5.8	
3	73 57	16 20	SW$_b$S	2.3	50.8	5.2	5.6	84	Cust.	10					5.4	
4	73 55	15 57	SW$_b$S	2.6	50.6	4.8	5.4	84	Cust.	10			WNW	1	6.4	⊙
5	73 53	15 36		0.0	50.2	5.1	5.5	85	Cust.	10				0	7.0	
6	73 52	15 23	ENE	0.7	50.1	5.2	6.3	95	Cust. Cu.	5				0	6.6	
7	73 51	14 58	NW$_b$N	2.6	49.9	4.4	5.4	87	Cust.	10	●°		WNW	1	6.9	
8	73 49	14 34	W$_b$N	3.5	49.8	4.2	5.4	87	Cust.	10			WNW	1	6.9	
9	73 47	14 21	W	2.8	49.8	5.8	5.5	81	Cu. Ci.	3				0	7.2	⊙
10	73 47	14 21	WNW	3.6	50.3	6.0	6.1	88	Str. Ci.	3			W	1	7.4	
11	73 43	14 8	W	0.0	50.2	7.0	5.5	74	Str. Cust.	8			W	1	7.4	
12	73 43	14 8	WNW	2.4	50.2	7.5	5.5	70	Str. Ci.	7			W	1	7.4	
1p.m.	73 43	14 8	NW$_b$W	2.2	50.1	8.0	5.4	67	Str. Ci.	6			W	1	7.4	
2	73 43	14 8		0.0	49.5	8.0	5.6	69	Str. Ci.	4			SW	1	7.4	
3	73 43	14 8		0.0	49.8	8.0	5.6	69	Str. Ci.	3			SW	1	7.8	
4	73 43	14 8		0.0	49.9	8.0	5.6	69	Str. Ci.	6				0	8.2	
5	73 43	14 8		0.0	49.4	8.0	6.0	75	Str. Ci.	9				0	7.2	
6	73 41	14 3	NNE	0.1	49.4	6.2	6.7	94	Cust.	10				0	7.7	
7	73 35	13 53	WNW	8.5	49.4	4.2	5.7	92	Cust.	10			W	1	6.8	●p at 6.50
8	73 28	13 41	WNW	8.0	49.6	4.2	5.0	80	Cust.	10			W	1	6.6	⊙
9	73 23	13 34	W	8.0	49.5	4.2	5.0	80	Cust.	10			W	1	6.9	
10	73 18	13 25	W$_b$N	7.0	49.6	4.1	5.4	88	Cust.	10	●°		W	2	7.0	⊙
11	73 12	13 16	W	8.5	49.7	4.1	5.1	84	Cust.	10			W	2	6.8	
12	73 6	13 7	W	7.4	49.7	4.4	4.8	77	Cust.	10			W	2	6.8	

1878. July 13.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1 a.m.																
2																
3																
4																
5																
6																
7																
8	Hammerfest.															
9																
10																
11																
12	70° 57′	22° 51′ E														
1 p.m.	70 58	22 40	N$_b$W	1.2	756.4	13.4	9.1	80	Ci.	0			ENE	2	10.9	
2	71 0	22 19	ENE	1.4	56.4	14.0	9.2	78	Ci.	0			ENE	2	11.6	
3	71 2	21 57	S$_b$E	1.4	56.0	14.2	9.6	80	Ci.	0			ENE	2	11.4	
4	71 4	21 39	S	1.4	56.0	13.4	9.0	78	Ci.	0			ENE	2	10.6	
5	71 6	21 20	S$_b$E	4.7	56.2	11.7	8.9	87		0			E	2	10.1	
6	71 7	21 15	SSW	3.7	55.9	11.8	8.8	86	Ci.	0			E	2	9.7	
7	71 8	21 3	E$_b$N	6.4	56.0	10.8	8.7	90	Ci.	0			E	2	9.8	
8	71 9	20 41	SSW	3.4	56.1	10.5	8.6	92	Ci.	0			E	2	9.6	
9	71 11	20 22	WSW	3.1	56.3	9.8	8.8	98		10	≡^{2}●^{0}		ENE	2	9.0	
10	71 13	20 0	WSW	3.1	56.1	7.2	7.6	00		10	≡^{2}●^{0}		ENE	2	9.2	
11	71 14	19 40	WSW	3.8	55.9	7.0	7.5	00		10	≡^{2}●^{0}		ENE	2	9.0	
12	71 16	19 19	WSW	4.4	55.8	7.0	7.4	99		10	≡^{2}●^{0}		ENE	2	9.0	

1878. July 14.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1 a.m.	71 17	19 0 E	WSW	5.3	755.6	6.8	7.4	00	Cust.	10	≡●		ENE	2	8.9	
2	71 19	18 40	WSW	6.0	56.0	6.6	7.3	00	Cust.	8	≡●		ENE	2	8.6	
3	71 20	18 21	WSW	6.5	55.9	6.6	7.2	99	Cust.	10	≡●		ENE	2	8.5	
4	71 22	18 2	WSW	6.6	55.3	6.6	7.2	99	Cust.	10	≡●		ENE	2	8.6	
5	71 24	17 43	WSW	5.7	55.7	6.6	7.1	98	Cust.	10	≡		ENE	2	7.6	
6	71 25	17 23	WSW	5.0	55.6	6.6	7.2	99	Cust.	10	≡		WSW	2	7.4	
7	71 28	17 1	WSW	5.0	55.7	7.6	7.8	00	Cust.	10	≡		WSW	2	8.8	
8	71 29	16 40	W$_b$S	5.7	55.6	7.2	7.4	98	Cust.	10			WSW	2	8.8	
9	71 30	16 20	WSW	5.1	55.4	7.3	7.1	93	Cust.	10			W	2	8.5	⊙ at 8.45.
10	71 32	15 58	SW$_b$W	4.3	55.4	7.8	7.1	90	Cust.	10			W	2	8.1	
11	71 34	15 32	WSW	3.4	55.4	8.0	7.2	90	Cust.	10			W	2	8.8	
12	71 35	15 11	N$_b$W	6.0	55.6	8.3	7.7	94	Cust.	10	≡^{0}●^{0}		SW	2	9.1	
1 p.m.	71 37	15 0	WNW	2.9	55.7	8.4	7.1	87	Cust.	10			NW	2	9.0	
2	71 39	14 40	WNW	3.6	56.0	7.7	7.1	90	Cust.	9			NW	2	9.0	
3	71 42	14 19	WNW	3.1	55.7	7.8	6.8	86	Cust.	10			NW	2	8.9	⊙
4	71 44	14 0	WNW	2.2	55.7	6.9	6.7	90	Cust.	10			NW	2	8.7	⊙
5	71 46	13 40	WNW	2.7	55.9	6.2	6.0	85	Cust.	10			NW	2	8.8	⊙
6	71 48	13 21	WNW	3.1	55.9	6.0	6.0	87	Cust.	10			NW	2	8.2	⊙
7	71 50	13 3	W$_b$N	2.8	55.9	5.8	6.1	88	Cust.	10			NW	2	8.0	⊙ at 6.30.
8	71 52	12 44	W$_b$N	2.4	55.8	5.8	5.8	85	Cust.	9			NW	2	7.8	
9	71 54	12 26	W$_b$N	2.3	56.1	5.4	6.1	91	Cust.	7			NW	2	8.1	
10	71 57	12 5	WNW	2.3	55.9	5.0	5.7	87	Cust.	10			NW	2	7.7	
11	71 59	11 40	WNW	2.9	55.7	5.0	5.7	87	Cust.	10			NW	1	7.0	
12	71 59	11 40	W$_b$N	2.2	55.6	4.8	5.6	87	Cust.	10			NW	1	7.0	

1878. July 15.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1 a.m.	71° 58′	11° 39′ E	SW	2.2	756.0	4.8	5.6	87	Cust.	10			SW	1	7.0	
2	71 57	11 37	SW	4.2	55.7	5.0	5.6	86	Cust.	10			SW	1	7.0	
3	71 57	11 37	SW	1.8	55.5	5.0	5.9	90	Cust.	10			SW	1	7.1	
4	71 57	11 35	SW	1.7	55.3	5.4	5.7	85	Cust.	10			SW	1	7.1	
5	71 56	11 31	SSW	3.7	55.2	5.7	5.9	86	Cust.	10			SW	1	7.1	
6	71 56	11 31	SW$_b$W	3.5	55.2	6.2	6.1	87	Cust.	10			SW	1	7.1	
7	71 56	11 31	SW$_b$W	4.5	55.1	6.3	6.3	88	Cust.	10			SW	1	7.1	
8	71 55	11 30	SW$_b$W	3.2	55.1	6.9	6.0	81	Cust.	10			SW	1	7.2	
9	71 55	11 30	SW	4.0	54.9	7.5	6.4	83	Str.	8			SW	1	7.4	⊙
10	71 57	11 24	WSW	5.1	55.2	6.8	6.5	88	Str.	7			SW	1	7.9	
11	71 58	11 4	SW	3.3	55.0	7.0	6.4	85	Str.	8			SW	1	7.8	⊙
12	72 1	10 40	SW	3.9	54.7	7.3	7.0	91	Str.	9			SW	1	7.8	
1 p.m.	72 4	10 18	SW	3.7	54.4	7.6	7.2	93	Str.	9			SW	1	7.9	
2	72 6	9 53	SSE	7.7	54.4	7.8	7.3	93	Cust.	10			SW	2	7.7	≡^{0} ●^{0} at 2.30.
3	72 7	9 29	SSE	6.0	53.7	7.4	7.2	94	Cust.	10	≡^{0}●^{0}		SW	2	6.4	
4	72 9	9 6	S	7.3	53.8	7.4	7.5	98	Cust.	10	≡^{0}●^{0}		SW	1	6.8	
5	72 12	8 45	S$_b$E	6.3	53.0	7.4	7.5	98	Cust.	10			SSW	2	6.6	
6	72 14	8 24	S$_b$E	8.3	52.8	7.0	7.5	00	Cust.	10			SSW	2	6.0	
7	72 15	8 9	SW	6.5	52.6	7.4	7.5	98	Cust.	10			SW	2	6.7	
8	72 15	8 9	SW	5.1	52.5	7.2	6.9	91	Cust.	10			WSW	2	6.1	
9	72 15	8 9	S	8.0	52.4	7.3	7.0	91	Cust.	10			SW	3	6.0	*d* at 9.30.
10	72 17	7 54	S	11.1	51.8	7.1	7.2	96	Cust.	10	●^{0}		SSW	3	6.8	*d.*
11	72 19	7 35	S	13.3	51.7	6.9	7.1	96	Cust.	10	●^{0}		S	4	6.9	*d.*
12	72 21	7 18	S	13.1	51.1	6.5	6.8	94	Cust.	10			S	4	6.2	

1878. July 19.

h	φ	λ		a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1a.m.	74° 54′	1° 2′	W	NW	11.0	748.4	2.5	5.4	98	Cust.	10			NW	4	3.4	
2	74 59	1 1		NW	11.8	48.5	2.2	5.2	98	Cust.	10			NW	4	3.3	
3	75 3	0 59		NW	10.5	48.9	2.2	5.4	00	Cust.	10			NW	4	3.4	
4	75 6	0 58		NW	11.1	48.9	2.2	5.4	00	Cust.	10			NW	4	3.4	
5	75 9	0 57		NW	12.4	49.4	2.1	5.2	98	Cust.	10			NW	5	3.3	
6	75 14	0 56		NW	10.2	50.0	1.9	5.2	98	Cust.	10			NW	5	2.9	
7	75 16	0 54		NWbN	9.7	50.6	1.8	5.1	98	Cust.	10			NW	4	3.0	
8	75 16	0 54		NNW	11.0	50.9	1.5	4.8	94	Cust.	10			NW	4	3.0	
9	75 16	0 54		NW	8.1	51.1	2.0	5.0	94	Cust.	10			NW	4	3.2	
10	75 16	0 42		NWbW	7.7	51.5	2.0	5.2	96	Cust.	10			NNW	4	3.0	
11	75 15	0 16	W	NWbW	7.3	51.8	2.4	5.1	93	Cust.	10			NNW	4	3.6	
12	75 15	0 3	E	WNW	5.5	52.2	2.4	5.1	93	Cust.	10			NNW	4	3.4	⊙
1p.m.	75 14	0 30		NWbW	6.0	52.7	2.5	5.1	93	Cust.	10			NNW	4	3.1	
2	75 14	0 58		NWbW	7.2	52.8	2.5	5.0	91	Cust.	10			NNW	4	3.1	⊙
3	75 13	1 27		WNW	6.0	52.9	2.3	5.1	94	Cust.	10			NNW	4	3.1	
4	75 13	1 54		NWbW	6.8	53.3	2.4	5.1	93	Cust.	10			NNW	4	3.0	
5	75 12	2 21		NWbW	6.4	53.4	2.4	5.1	93	Cust.	10			NNW	4	3.2	
6	75 12	2 48		WNW	6.3	53.4	2.5	5.0	91	Cust.	10			NNW	4	3.1	⊙
7	75 12	3 2		W	6.2	53.7	2.4	5.0	91	Cust.	10			NW	3	3.3	Clears up in W.
8	75 12	3 2		W	5.6	54.0	2.0	4.9	93	Cust.	10			NW	3	3.3	
9	75 12	3 2		WSW	5.5	54.2	2.1	4.9	91	Str. Cu.	9			NW	3	3.1	
10	75 12	3 2		WbS	5.9	54.5	2.4	4.8	87	Str. Cu.	9			NNW	2	3.0	Water blue.
11	75 12	3 2		W	5.6	54.4	2.9	4.8	85	Cust.	9			NNW	2	3.0	
12	75 12	3 2		W	3.3	54.5	2.9	4.9	86	Str. Cu.	8			NNW	1	3.0	

1878. July 20.

h	φ	λ		a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1a.m.	75 12	3 2	E	W	4.7	754.6	3.0	5.0	88	Str. Ci.	7			NNW	2	3.0	
2	75 12	3 2		SW	5.0	54.7	3.1	5.0	88	Str. Ci.	8			NNW	2	3.0	
3	75 10	3 2		SW	5.0	54.7	3.2	5.2	90	Str. Ci.	9			N	2	3.0	
4	75 7	3 2		SW	5.0	54.7	3.2	5.2	90	Str. Ci.	8			N	2	3.0	
5	75 7	3 2		SW	4.7	55.2	3.0	5.3	93	Str. Cu.	9			N	2	3.1	
6	75 5	3 2		SSW	4.0	55.2	3.7	5.0	83	Cust.	10			NW	2	3.1	
7	75 5	3 2		SWbS	2.6	55.2	3.6	5.4	92	Cust.	10			NW	1	3.2	
8	75 5	3 10		SW	5.0	55.5	3.6	5.4	92	Cust.	10			WNW	1	3.2	
9	75 4	3 42		WSW	6.7	55.9	3.9	5.4	88	Cust.	10			W	1	3.4	
10	75 3	4 18		W	0.5	55.9	3.9	5.3	87	Cust	10			NW	1	3.4	Water blue.
11	75 3	4 48			0.0	56.2	4.0	5.4	88	Cust. Cicu.	9			NW	1	3.8	
12	75 3	4 48			0.0	56.2	4.0	5.4	88	Cust. Cicu.	9			NW	1	3.8	
1p.m.	75 3	4 51		NEbE	0.0	56.1	5.0	5.5	84	Cust. Cicu.	9			NW	1	3.6	
2	75 3	4 51		SEbS	3.8	56.2	4.6	5.3	84	Cust. Ci.	9			N	1	3.6	
3	75 3	4 51		SSE	4.3	56.5	4.4	5.1	82	Cu. Str. Ci.	8			N	1	3.7	
4	75 2	5 10		E	4.1	56.8	3.9	5.1	84	Ci.	5			N	1	4.0	⊙
5	75 2	5 21		EbS	4.5	56.3	3.8	5.0	83	Ci. Cust.	9			N	1	4.1	
6	75 2	5 48		EbS	4.3	56.4	4.0	5.1	84	Cust.	10			N	1	4.2	
7	75 2	6 15		EbS	4.3	56.2	4.1	5.1	84	Cust.	10			N	1	4.2	
8	75 2	6 39		EbS	4.6	56.7	4.3	5.0	80	Cust.	10	●°		N	1	4.6	
9	75 2	7 3		EbS	4.5	56.8	4.0	5.7	93	Cust.	10	●°		NNW	1	4.2	
10	75 2	7 27		EbS	4.3	56.9	4.2	5.8	93	Cust.	10			NNW	1	4.6	
11	75 1	7 49		ESE	4.2	56.9	4.4	5.8	93	Cust.	10			NW	1	5.3	
12	75 1	7 56		ESE	4.6	56.9	4.6	5.9	94	Cust.	10			N	1	5.3	

1878. July 21.

h	φ	λ		a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1a.m.	75 1	7 56	E	ESE	4.7	756.9	4.5	5.9	94	Cust.	10			ESE	1	5.4	
2	75 1	7 56		E	2.1	56.7	4.5	5.8	92	Cust.	10			E	1	5.4	
3	75 1	8 10		E	2.1	56.9	4.4	5.7	92	Cust.	10			E	1	5.3	
4	75 1	8 37		E	2.8	56.9	4.6	5.6	89	Cust.	10			E	1	5.2	
5	75 1	9 1		SE	4.6	56.4	4.9	6.0	94	Cust.	10			ESE	1	5.3	⊙ at 5.45.
6	75 0	9 27		SbE	6.0	56.4	4.8	5.8	90	Cust.	10			SE	1	5.2	At 6h 30m ●°
7	75 0	9 52		SSE	7.1	56.4	4.8	5.6	87	Cust.	10			SE	1	5.2	
8	75 0	10 17		SEbS	4.2	56.8	4.8	6.0	94	Cust.	10	●°		SE	1	5.4	
9	75 0	10 27		SE	5.5	56.9	5.9	6.2	90	Cust.	10			S	1	5.4	⊙
10	75 0	10 27		SE	4.6	56.9	6.1	6.4	91	Cust.	10			ESE	1	5.4	⊙
11	75 0	10 37		ESE	5.8	56.8	5.7	6.2	91	Cust.	10			ESE	1	5.4	⊙
12	75 0	10 55		ESE	7.3	56.8	5.4	6.3	94	Cust.	10			ESE	1	5.4	
1p.m.	74 59	11 20		ESE	4.4	56.8	5.5	6.2	93	Cust.	10			ESE	2	5.1	
2	74 59	11 48		SEbS	8.1	56.6	5.8	6.3	91	Cust.	10			SE	2	5.6	⊙
3	74 58	12 10		SE	6.4	56.5	5.8	6.2	90	Cust.	10			SE	2	5.8	
4	74 58	12 10		SbW	6.1	56.4	5.6	6.0	88	Cust.	10			S	2	5.8	⊙
5	74 58	12 25		SEbS	7.8	56.2	5.0	5.5	84	Cust. Cu.	10			SE	2	5.4	
6	74 57	12 43		SEbE	5.0	56.1	4.8	5.4	84	Cust.	10			SSE	2	5.3	
7	74 57	12 43		E	7.0	55.8	4.4	5.1	82	Cust. Cu.	10			ESE	2	5.2	
8	74 57	12 43		SE	6.0	55.6	4.2	5.2	85	Cust. Cu.	10			SSE	2	5.2	
9	74 57	13 5		EbS	5.5	55.6	4.1	5.1	84	Cust. Cu.	10			E	2	5.6	Water green.
10	74 57	13 18		SE	6.0	55.3	4.2	5.2	84	Cust.	10			SE	2	5.6	
11	74 56	13 30		E	4.7	55.3	3.8	5.6	93		10	≡●°		E	2	5.6	At 11.0 commenced ≡●
12	74 56	13 50		E	7.0	54.8	4.6	5.8	92	Cust.	10			ESE	2	5.5	

1878. July 30.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1a.m.	71° 16′	23° 22′ E	E	4.7	762.3	9.0	8.1	95	Cust. Ci.	7			ENE	1	9.2	
2	71 22	23 16	E	4.4	62.2	9.0	8.1	95	Cust. Ci.	8			ENE	1	9.2	
3	71 29	23 10	SSE	1.9	62.2	9.1	8.1	95	Cust.	9			ENE	1	9.1	
4	71 36	23 4	SSE	3.5	62.2	9.1	8.1	93	Cust.	8			ENE	1	9.2	
5	71 42	22 58	SSE	1.8	62.2	9.2	8.2	95	Cust.	9			ENE	1	8.8	*d*
6	71 49	22 52	S$_b$E	1.4	61.9	9.0	8.2	96	Cust.	10			E	1	8.5	
7	71 56	22 45	S$_b$W	6.0	62.0	9.2	8.2	95	Cust.	10			E	1	8.2	
8	72 1	22 39	SSW	8.9	62.0	9.0	8.3	97	Cust.	10			SW	1	8.2	≡°
9	72 7	22 34	SW$_b$S	11.0	61.5	9.0	8.3	97	Cust.	10			SW	1	8.4	Water greyish green.
10	72 14	22 28	SW	8.0	61.3	9.0	8.2	96	Cust.	10			SW	1	8.4	
11	72 19	22 23	SW$_b$S	10.7	61.3	8.9	8.4	99	Cust.	10			SW	1	8.4	
12	72 26	22 16	SW$_b$S	11.0	61.1	8.8	8.3	99	Cust.	10			SW	1	8.4	⊙
1p.m.	72 34	22 8	SW$_b$S	10.3	61.1	8.6	8.1	98	Cust.	10			SW	1	8.0	⊙
2	72 42	22 0	SW$_b$S	10.2	61.0	8.4	8.0	97	Cust.	10	●°		SW	1	8.0	≡°
3	72 49	21 55	SW	10.4	61.0	8.0	7.8	98	Cust.	10	●°		SW	1	7.8	≡°
4	72 53	21 51	SW$_b$W	11.0	61.3	8.0	7.3	92	Cust.	10			SW	2	7.9	
5	72 53	21 43	W$_b$S	8.4	61.3	8.2	7.2	89	Cust.	10			SW	2	7.9	⊙
6	72 54	21 39	W	6.0	62.0	8.3	7.4	91	Cust.	10			WSW	2	7.6	
7	72 55	21 35	W	4.6	62.2	8.3	7.4	91	Cust.	10			WSW	2	7.6	
8	72 57	21 31	SW$_b$W	8.6	61.7	7.8	7.5	94	Cust.	10			SW	2	7.8	
9	73 3	21 27	SW$_b$W	10.1	62.0	8.0	7.1	89	Cust.	10			WSW	2	7.4	
10	73 9	21 22	SW$_b$W	9.0	62.2	7.6	7.1	91	Cust.	10			WSW	2	7.4	
11	73 14	21 17	SW	6.4	62.2	7.6	7.1	91	Cust.	10			WSW	2	7.2	
12	73 20	21 11	SW$_b$W	6.7	62.2	7.4	7.1	93	Cust.	6			W	2	7.0	

1878. July 31.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1a.m.	73 25	21 5 E	SW$_b$W	6.1	762.1	7.3	7.2	94	Cust.	10	≡●°		WSW	2	7.0	
2	73 31	21 1	SW$_b$S	5.0	62.1	7.2	7.4	98	Cust.	10	≡●°		WSW	2	6.9	
3	73 36	20 55	SW	5.3	61.4	7.6	7.6	98	Cust.	10			WSW	2	6.9	
4	73 43	20 51	SW$_b$S	4.5	61.3	7.6	7.5	96	Cust.	10	●°		WSW	2	6.9	
5	73 47	20 48	SW$_b$W	7.4	61.1	7.6	7.6	98	Cust.	10	●°		SW	2	6.9	
6	73 47	20 48	SW	4.5	61.1	7.6	7.5	96	Cust.	10	●°		WSW	2	6.9	
7	73 53	20 41	SSW	7.5	60.7	7.7	7.5	96	Cust.	10			WSW	2	5.8	
8	73 59	20 33	SW$_b$S	7.5	60.6	6.2	6.9	97		10	≡		WSW	2	3.2	⊙
9	74 2	20 30	SSW	7.1	60.4	5.7	6.7	99		10	≡		WSW	2	2.9	
10	74 8	20 12	S$_b$W	7.7	60.2	5.2	6.6	00		10	≡		SW	2	1.6	
11	74 16	20 15	S$_b$W	8.4	59.5	5.0	6.3	97	Cust.	10			SW	2	1.7	Water blue.
12	74 21	20 2	NW	2.6	58.8	4.7	6.3	98	Cust.	10			SSW	2	1.2	Beeren Eiland in sight.
1p.m.	74 27	19 47	NW$_b$W	2.5	58.5	4.4	6.0	97		10	≡		SSW	2	1.8	
2	74 29	19 38	SSW	11.8	57.1	6.8	7.0	94		10	≡		SSW	2	1.7	
3	Beeren Eiland		S$_b$W	11.7	56.2	7.7	7.3	93		10	≡●		SSW	2	2.1	
4	NE. Side.		S	12.2	56.2	5.6	6.6	97		10	≡●		S	2	2.4	
5			S	11.4	55.3	5.8	6.6	96		10	≡●°		S	2	2.4	
6			SSW	13.4	54.6	8.2	7.8	96		10	≡●°		SSW	2	2.1	
7			SSW	14.9	53.8	7.2	7.4	98		10	≡		SSW	2	1.9	
8			SSW	15.5	53.7	7.6	7.6	98		10	≡		SSW	2	2.2	
9			SW$_b$S	12.8	53.8	7.0	7.5	00		10	≡●°	1.5	SW	1	2.1	
10			SW	13.8	53.7	6.4	7.2	00		10	≡●°		SSW	1	2.0	
11			SW	11.4	53.9	5.4	6.7	00		10	≡^{2}		SW	1	2.0	
12			SW$_b$W	9.9	54.1	4.2	6.2	00		10	≡^{2}		WSW	1	1.9	

1878. August 1.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1a.m.	Beeren Eiland.		SW$_b$W	9.8	754.4	3.9	6.1	00	Cust.	10			SW	2	1.9	
2	NE. Side;		W$_b$S	10.5	54.7	5.0	6.4	98	Cust.	10			WSW	2	1.9	
3	off English River.		WSW	7.8	55.2	5.3	6.3	96	Cust.	10			WSW	2	1.9	
4			W	10.2	55.7	5.2	6.3	95	Cust.	10			WSW	2	1.9	
5			SW	14.8	55.8	5.1	6.3	95	Cust.	10			WSW	2	2.1	
6			SW	13.0	55.9	5.1	6.4	97	Cust.	10			SW	2	2.2	
7			SW	10.4	56.8	4.8	6.1	96	Cust.	10			SW	2	2.0	
8			E$_b$S	9.4	56.8	4.8	6.0	94	Cust.	10			WSW	2	1.8	
9			W$_b$S	10.4	56.8	4.7	6.1	96	Cust.	10			W	2	1.8	
10			W	11.4	56.9	5.3	6.3	96	Cust.	10			WSW	2	1.9	Swell from W.
11			WSW	9.9	57.4	5.2	6.3	95	Cust.	10			WSW	2	1.9	
12			W$_b$S	10.9	57.7	5.4	6.3	94	Cust.	10			W	2	1.9	
1p.m.			SW$_b$W	12.6	57.4	4.9	5.9	92	Cust.	10			SW	2	1.9	
2			W$_b$S	13.8	57.4	5.2	6.2	94	Cust.	10			WSW	2	2.4	
3			W	12.4	57.5	5.1	6.3	95	Cust.	10			W	2	2.5	
4			W$_b$S	14.2	57.5	4.8	6.0	94	Cust.	10			W	2	2.2	
5			W$_b$S	13.2	57.4	5.2	6.2	94	Cust.	10			WSW	2	2.2	
6			WSW	11.0	57.5	5.3	6.3	96	Cust.	10			WSW	2	2.2	
7			SW	11.3	57.5	5.4	6.5	97	Cust.	10			WSW	2	2.0	
8			SW$_b$W	11.5	57.0	5.3	6.5	97	Cust. Str.	8			W	2	2.0	
9			SW$_b$S	11.5	57.1	5.5	6.5	97	Cust. Str.	8			SW	2	2.0	
10			W$_b$S	11.8	56.8	6.4	7.0	98	Cust. Str. Ci.	5			WSW	2	2.4	
11			SW$_b$W	11.2	56.5	6.4	7.0	98	Cust.	10			WSW	2	2.4	
12			SW$_b$W	8.6	55.9	7.0	7.2	96		10	≡●°		WSW	2	2.6	

1878. August 5.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1 a.m.	76° 6′	13° 10′ E	NW$_b$N	6.1	763.6	4.4	5.0	80	Cust.	10			NNW	2	5.8	
2	76 6	13 7	NW$_b$N	7.8	63.2	4.4	5.1	82	Cust.	10			NW	2	5.8	
3	76 6	13 7	NW$_b$N	8.8	63.1	4.2	5.0	80	Cust.	10	●°		NW	2	5.8	
4	76 6	13 3	NW$_b$W	8.7	62.9	3.6	4.9	83	Cust.	7			WNW	2	5.8	
5	76 6	13 3	NW	8.5	63.1	3.6	5.1	87	Cust.	8			NW	2	5.8	⊙
6	76 6	13 0	NW	11.0	63.0	3.8	5.2	87	Cust.	10			NW	2	5.8	
7	76 9	13 22	NW	11.3	62.7	3.6	5.1	87	Cust.	10			NW	2	5.6	
8	76 11	13 43	NW	12.4	62.6	3.5	5.1	87	Cust.	10			NW	2	5.6	
9	76 12	14 0	N$_b$W	8.2	62.8	4.1	5.2	85	Cust.	10		1.5	NW	2	6.0	
10	76 14	14 17	NW	11.2	62.5	4.1	5.4	88	Cust.	10			NE	2	6.3	
11	76 16	14 39	NW$_b$N	9.4	62.6	4.2	5.0	80	Cust.	10			NNW	2	5.4	
12	76 17	14 41	NW$_b$N	11.0	62.6	4.2	5.0	80	Cust.	10			NNW	2	4.0	Made Spitzbergen. (South Cape).
1 p.m.	76 18	15 11	NW$_b$N	10.0	62.5	3.4	5.2	90	Cust.	10			NNW	2	5.0	Water bluish grey.
2	76 19	15 37	NW	9.7	62.2	2.5	4.8	87	Cust.	10			NNW	2	1.2	
3	76 19	15 52	NW$_b$N	9.2	62.0	2.5	4.8	87	Cust.	10			NNE	2	1.0	
4	76 20	16 0	NNW	8.8	61.9	2.8	5.4	96	Cust.	10			NNW	2	3.5	Water light grey.
5	76 21	16 5	NW$_b$W	10.7	61.7	2.8	5.0	89	Cust. Ci.	5			NW	2	2.4	
6	76 22	16 38	NW	7.7	61.5	3.0	5.1	90	Cust.	7			NNW	2	2.9	
7	76 24	16 56	NW$_b$N	9.1	61.5	3.0	5.0	88	Cust.	9			NW	2	2.9	Passed South Cape.
8	76 28	17 10	NW$_b$N	6.8	61.5	3.0	5.1	90	Cust.	8			WNW	1	3.1	Entered Stor-Fjord.
9	76 31	17 14	W$_b$N	9.5	61.6	2.9	5.2	91	Cust.	7			WNW	2	3.0	
10	76 36	17 12	NW	10.0	61.6	2.8	5.0	89	Cust. Ci.	5			NW	2	2.8	Off the great glacier.
11	76 34	17 19	W$_b$N	7.9	61.7	2.7	5.1	91	Cust.	2			WNW	2	2.6	
12	76 31	17 23	W	7.7	61.5	3.0	5.1	90	Cust.	2			WNW	2	3.2	Stor Fjord.

1878. August 6.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1 a.m.	76 30	17 20 E	NW	8.1	761.8	3.1	4.9	87	Cust.	3			NW	1	3.2	Stor-Fjord.
2	76 29	17 19	WNW	8.0	61.7	3.0	4.7	83	Cust.	3			WNW	2	2.9	
3	76 28	17 17	WNW	10.0	61.7	2.7	4.8	85	Cust. Ci..	3			WNW	2	2.8	
4	76 26	17 15	NW$_b$W	9.8	61.7	3.0	4.7	83	Cust. Ci.	3			WNW	2	2.8	
5	76 23	17 31	WNW	7.7	61.8	3.1	4.9	87	Cust.	3			W	2	3.6	
6	76 20	17 54	WNW	7.9	62.4	3.2	5.0	87	Cust.	3			W	2	3.6	
7	76 19	18 1	NW$_b$W	8.6	62.2	3.0	4.8	85	Cust.	3			NW	2	3.4	
8	76 18	17 57	NW$_b$W	7.6	62.3	2.8	4.9	88	Cust.	3			WNW	2	3.4	
9	76 17	17 53	NW$_b$W	8.4	62.5	2.9	4.8	85	Cust.	3			N	2	3.4	
10	76 16	17 49	NW$_b$N	8.3	62.7	2.8	4.9	88	Cust.	3			NNW	2	3.7	
11	76 16	17 44	W	6.6	63.2	2.9	4.9	86	Cust.	10			W	2	3.6	
12	76 17	17 25	W$_b$N	5.0	63.1	2.6	4.8	85	Cust.	9			NW	2	3.4	Ice in sight.
1 p.m.	76 20	16 59	W$_b$N	8.0	63.2	2.6	4.8	85	Cust.	9			NW	2	2.9	
2	76 21	16. 34	W$_b$N	7.8	63.3	3.0	4.6	81	Cust.	7			WNW	2	2.9	Passed South Cape.
3	76 23	16 11	W$_b$N	5.7	63.3	2.4	4.7	85	Cust.	10			WNW	2	3.2	
4	76 25	15 52	W$_b$S	5.5	63.1	2.5	4.7	84	Cust.	10			WNW	2	2.8	
5	76 30	15 39	W$_b$N	6.9	63.1	2.2	4.8	89	Cust.	10			WNW	2	2.6	
6	76 30	15 23	NW$_b$W	4.0	63.0	1.7	4.6	90	Cust.	10			WNW	2	2.4	
7	76 31	14 51	NW	4.3	62.6	2.0	4.5	85	Cust.	10			WNW	1	2.4	
8	76 31	14 31	NW	5.0	62.8	2.0	4.7	89	Cust.	10			WNW	1	3.1	
9	76 32	14 3	W	1.4	62.8	2.3	4.7	85	Cust.	10			WNW	1	4.0	
10	76 32	13 47	W	1.2	62.7	2.4	4.6	84	Cust.	10			W	1	6.2	
11	76 33	13 18	W	2.9	62.7	2.6	4.6	82	Cust.	10			W	1	6.2	
12	76 33	13 18	W$_b$S	5.2	62.7	2.8	4.7	82	Cust.	10			WNW	1	6.0	

1878. August 7.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1 a.m.	76 34	13 4 E	WNW	4.3	762.2	3.0	4.7	83	Cust.	10			W	1	6.2	
2	76 34	12 51	W	3.8	62.1	2.6	4.6	82	Cust.	10			SW	1	5.8	
3	76 34	12 51	W$_b$N	3.7	61.9	3.1	4.7	83	Cust.	10			SSW	1	5.2	
4	76 35	12 56	W	4.9	61.3	3.2	4.6	80	Cust.	10			SSW	1	5.2	
5	76 37	12 59	W	4.1	61.1	3.2	4.8	83	Cust.	10			SSW	1	6.2	
6	76 38	13 0	W	4.0	60.9	2.6	4.9	89	Cust.	10			SSW	1	6.4	
7	76 38	13 0	W	4.0	60.8	2.8	4.7	82	Cust.	10			SSW	1	6.4	
8	76 38	13 0	W$_b$N	3.3	60.1	3.0	5.1	90	Cust.	10			WNW	1	6.2	
9	76 39	12 40	S	2.1	59.8	3.2	4.4	76	Cust.	10			WSW	1	6.2	
10	76 40	12 14	SW$_b$S	4.2	59.4	3.7	5.7	95	Cust.	10			WSW	1	5.9	
11	76 40	11 48	SW$_b$S	5.2	59.1	4.0	5.7	93	Cust.	10			WSW	1	5.6	
12	76 41	11 23	SW$_b$S	5.4	58.8	4.2	5.8	93	Cust.	10			WSW	1	5.2	
1 p.m.	76 42	11 16	W	4.9	58.4	4.4	5.5	89	Cust.	10			SW	1	5.2	
2	76 42	10 55	SW$_b$W	4.9	58.1	3.5	5.1	87	Cust.	10	●°		WSW	1	5.2	
3	76 42	10 29	W	5.7	57.8	2.8	5.3	94	Cust.	10	●°		SW	1	5.3	
4	76 42	10 9	WSW	6.2	57.8	2.7	5.3	94	Cust.	10			SSW	1	5.1	
5	76 42	10 9	W$_b$S	4.3	57.4	2.5	5.0	91	Cust.	10			WSW	1	5.0	
6	76 42	9 43	W$_b$S	4.9	57.0	2.6	4.9	89	Cust.	10			WSW	1	4.6	
7	76 41	9 19	W$_b$S	5.9	56.8	2.9	5.2	93	Cust.	10			WSW	1	4.9	
8	76 41	9 2	W$_b$S	6.0	56.0	3.4	5.1	87	Cust.	9			WSW	1	5.0	
9	76 41	8 36	WSW	6.2	56.0	4.8	5.1	79	Cust.	4			WSW	2	5.0	
10	76 41	8 11	SW$_b$W	7.3	55.6	4.2	5.6	90	Cust.	2			WSW	2	4.6	
11	76 41	7 47	W$_b$S	6.4	55.5	4.4	5.6	90	Cust.	1			WSW	2	4.4	
12	76 41	7 47	W$_b$S	8.1	55.3	4.4	5.6	90	Cust.	1			SW	2	4.4	

1878. August 11.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	77° 58′	5° 10′ E	NbE	8.7	755.5	3.2	5.0	87	Cust.	10			NNE	3	3.6	⊙
2	77 58	5 10	NbE	11.7	55.3	3.2	5.0	87	Cust.	10			NNE	3	4.4	
3	77 59	5 5	NbE	11.7	55.0	3.3	5.2	90	Cust.	8			NNE	3	4.4	⊙
4	77 59	5 0	NbE	12.2	54.4	3.2	5.2	90	Cust.	8			NNE	3	4.4	
5	78 0	4 57	NNE	10.5	54.3	3.0	4.9	87	Cust.	9			N	4	4.2	
6	78 0	4 54	NbE	13.2	54.1	3.2	4.7	81	Cust.	10			N	4	4.4	
7	78 0	4 50	NNE	11.9	53.7	3.3	4.6	80	Cust.	10			NNE	4	4.3	⊙
8	78 1	4 46	NbE	12.8	53.5	3.2	5.0	87	Cust.	10			NNE	4	4.3	
9	78 1	4 42	NbE	13.3	53.3	3.4	4.9	83	Cust. Cicu.	9			N	5	4.4	
10	78 2	4 40	NbE	12.0	53.1	3.5	4.9	83	Cust. Cicu.	9			N	5	4.4	
11	78 2	4 40	NbE	11.8	53.2	3.4	4.7	80	Cust.	9			N	5	4.4	
12	78 2	4 40	N	12.7	52.6	3.2	4.8	83	Cust.	10			N	5	4.4	
1p.m.	78 2	5 8	N	12.6	52.6	3.2	5.0	87	Cust.	10			N	5	4.4	
2	78 2	5 38	NbW	12.4	52.7	3.0	5.3	93	Cust.	10			NNE	5	4.2	Aneroid changed.
3	78 1	6 11	NbW	12.8	52.9	3.1	5.0	88	Cust.	8			NNE	5	4.4	
4	78 1	6 40	NbW	12.6	52.8	3.6	5.1	87	Cust.	9			NNE	5	4.6	
5	78 1	6 54	NNE	9.0	52.6	3.1	5.1	90	Cust.	10			NE	5	4.6	
6	78 1	6 54	NNE	8.1	52.7	3.0	5.1	90	Cust.	10			NNE	4	4.5	
7	78 0	7 5	NbW	7.5	52.7	2.8	5.0	89	Cust.	3			NNE	3	4.4	
8	78 0	7 39	NbW	6.4	52.8	3.3	5.1	88	Ci. Cu.	2			NNE	2	4.4	
9	78 0	8 12	NbW	6.8	53.0	4.0	5.5	90	Cust. Ci.	5			NNE	2	4.9	
10	78 0	8 32	EbS	3.2	53.2	4.6	5.7	90	Cust. Ci.	4			NE	2	4.9	
11	78 0	8 32	EbS	2.4	53.6	4.6	5.7	90	Cust. Ci.	4			NNE	2	4.6	
12	78 0	8 32	ESE	5.6	54.1	4.8	5.6	87	Ci.	0			NNE	2	4.6	

1878. August 12.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	78 0	8 57 E	NE	4.4	754.5	4.2	5.8	93	Cust.	1			NE	1	4.3	Off Ice-Fjord (Spitzbergen).
2	78 1	9 29	NEbN	3.3	54.5	4.0	5.5	90	Cust.	1			NE	1	4.0	
3	78 1	10 1	NEbN	2.9	54.6	4.4	5.4	87	Ci.	1			NE	1	4.4	
4	78 2	10 19	NE	2.1	54.9	4.5	5.3	84	Ci.	0			NE	1	4.5	
5	78 2	10 30	N	2.7	54.4	4.6	5.4	86	Ci.	0			NE	1	4.9	
6	78 3	11 0	W	3.4	55.0	5.0	5.5	84	Ci.	0			NE	1	5.0	
7	78 3	11 18		0.0	54.9	5.0	5.5	84	Ci.	0			NE	1	5.1	
8	78 3	11 18		0.0	55.1	6.8	5.9	80	Ci.	0			NE	1	4.6	
9	78 3	11 18		0.0	55.2	6.8	5.8	78	Ci.	0			NE	1	4.6	
10	78 4	11 18	WbN	6.0	55.2	6.3	5.7	79	Ci.	4			NW	1	6.6	
11	78 3	10 51	NNW	9.2	55.2	4.9	5.6	86	Ci.	5			NNW	1	4.3	
12	78 3	10 32	NWbN	8.9	54.9	4.7	5.8	90	Ci.	7			NW	1	4.3	
1p.m.	78 2	10 6	NWbN	9.8	54.7	3.3	5.6	97	Cust.	10			NW	2	4.3	
2	78 2	9 46	NW	10.1	54.8	3.2	5.6	97		10	≡		WNW	2	4.4	Water blue.
3	78 2	9 32	NWbN	9.9	54.6	3.1	5.6	98		10	≡		NW	2	4.3	
4	78 2	9 25	NW	6.2	54.4	4.0	6.0	98	Cust.	10			NW	2	4.8	
5	78 2	9 20	NW	10.3	54.0	4.2	6.0	97	Cust.	10			NW	2	4.8	
6	78 2	9 15	NW	9.4	54.0	4.0	5.9	97	Cust.	10			NW	2	5.0	
7	78 3	9 14	NWbN	6.9	52.9	4.4	5.8	93	Cust.	10			NW	2	5.0	
8	78 8	9 0	NWbN	10.4	52.8	3.8	5.4	90	Cust.	10			NW	2	4.4	
9	78 11	8 51	NbW	10.4	52.5	3.8	5.4	90	Ci. Cust.	7			NW	4	4.4	
10	78 14	8 42	NbW	10.2	52.4	4.2	5.4	87	Ci. Cust.	8			NNW	4	4.6	Short waves.
11	78 16	8 33	NbW	11.4	51.8	4.2	5.4	87	Cust.	8			NNW	4	4.4	
12	78 18	8 28	NNW	10.3	51.4	4.3	5.3	85	Ci. Cust.	7			NNW	4	4.6	

1878. August 13.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	78 20	8 21 E	NbW	11.7	751.2	4.1	5.0	82	Cust.	7			N	4	4.6	
2	78 22	8 15	NbW	10.8	50.9	4.0	5.0	82	Cust.	8			N	4	4.4	
3	78 24	8 7	NbW	10.3	51.0	4.0	5.3	87	Cust.	9			N	4	4.4	
4	78 28	7 55	N	8.9	51.4	4.0	5.4	88	Cust.	9			N	4	4.4	
5	78 31	7 47	N	11.4	51.5	4.2	5.4	87	Cust.	7			N	4	5.3	
6	78 34	7 38	NbE	11.0	51.2	4.6	5.5	87	Ci.	4			N	4	5.2	
7	78 36	7 30	NbE	10.6	51.2	4.6	5.3	84	Ci.	3			N	4	5.0	
8	78 39	7 21	NbE	13.2	51.1	4.5	5.3	84	Ci.	2			N	4	4.6	
9	78 42	7 14	NbE	12.4	51.4	4.6	5.2	82	Ci.	2			N	4	4.4	
10	78 44	7 5	NbE	9.2	51.8	4.8	5.6	87	Ci.	2			N	4	4.8	
11	78 47	6 58	NbE	9.8	51.9	5.0	5.5	84	Ci.	1			N	4	4.8	
12	78 49	6 50	NbE	12.2	52.0	5.0	5.5	84	Ci.	1			N	4	4.8	
1p.m.	78 52	6 37	NbE	12.3	52.0	5.2	5.4	81	Ci.	1			N	4	4.9	
2	78 54	6 25	NEbN	11.7	52.0	5.0	5.5	84	Ci.	1			N	4	5.1	
3	78 57	6 15	NEbN	14.6	52.1	4.9	5.5	84	Ci.	1			N	4	4.8	
4	79 0	6 6	NNE	12.9	52.2	4.8	5.7	89	Ci.	1			NNE	4	5.0	
5	79 2	5 53	NNE	13.3	52.5	5.0	5.5	84	Ci.	1			NNE	4	4.6	
6	79 5	5 40	NEbN	11.6	53.0	4.4	5.4	87	Ci.	1			NNE	4	3.8	
7	79 8	5 28	NEbN	10.2	53.3	4.7	5.5	86	Ci.	1			N	3	4.4	
8	79 8	5 28	NNE	12.4	53.0	4.2	5.6	90	Ci.	1			NNE	3	4.2	
9	79 8	5 28	NE	11.0	52.9	4.0	5.3	87	Ci.	1			NNE	3	4.2	
10	79 13	5 24	NEbN	10.9	53.1	4.0	5.2	85	Ci.	1			NNE	3	4.2	
11	79 17	5 20	NNE	13.9	53.6	4.2	5.0	80	Ci.	1			NNE	3	5.0	
12	79 21	5 15	NNE	11.7	54.0	4.0	5.7	93	Ci.	1			NNE	3	3.8	

1878. August 17.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	Magdalena Bay.		E	2.1	754.7	1.2	4.5	91	Cust.	10				0	2.0	
2	Burial Ground.		E_bS	1.5	54.6	1.4	4.6	91	Cust.	10				0	1.8	
3			SE_bE	1.3	54.4	1.4	4.4	87	Cust.	10				0	1.5	
4			SE_bE	1.2	54.0	2.0	4.5	85	Cust.	10				0	1.2	
5				0.0	53.8	2.2	4.9	91	Cust.	10				0	1.6	
6			SW	3.7	53.5	2.6	4.8	87	Cust.	10				0	1.8	
7			SW_bW	4.0	53.5	2.7	4.8	85	Cust.	10				0	1.9	
8			SW_bW	5.5	53.4	2.8	4.8	86	Cust.	10				0	2.6	
9				0.0	53.6	3.2	5.0	87	Cust.	10				0	2.7	
10				0.0	53.3	3.2	4.7	81	Cust.	10				0	2.0	
11				0.0	53.0	3.0	4.7	83	Cust.	10				0	2.2	
12			NW	1.9	53.1	2.9	4.8	85	Cust.	10				0	2.2	
1p.m.				0.0	53.0	2.9	4.8	85	Cust.	10				0	2.1	
2				0.0	53.0	2.7	4.7	84	Cust.	10				0	2.0	
3				0.0	52.8	2.8	4.7	84	Cust.	10				0	2.1	
4				0.0	52.9	2.9	4.9	86	Cust.	10				0	2.4	
5				0.0	53.0	3.0	4.9	87	Cust.	10				0	2.4	
6				0.0	53.0	3.0	4.9	87	Cust.	10				0	2.2	
7				0.0	52.9	2.6	4.9	89	Cust.	10				0	2.3	
8				0.0	52.8	2.8	5.0	89	Cust.	10				0	2.4	
9				0.0	52.7	2.4	5.1	93	Cust.	10				0	2.9	
10	79° 35′	11° 17′ E		0.0	52.9	2.6	5.1	93	Cust.	10				0	3.7	
11	79 35	11 17		0.0	53.0	2.4	5.3	96		10	≡●^{o}			0	3.6	
12	79 35	10 52	W_bN	5.4	52.8	2.6	4.8	87		10	≡●^{o}		SW	1	3.4	

1878. August 18.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	79 32	10 16 E	W_bS	1.2	752.8	1.6	5.2	00		10	≡		SW	1	2.2	
2	79 26	9 55	W	1.0	52.9	1.6	5.0	96		10	≡^{o}		SW	1	2.3	
3	79 20	9 34	S_bW	1.7	52.8	1.7	4.8	93	Cust.	10	●^{o}		SW	1	2.6	*d.*
4	79 14	9 13	NE_bN	3.5	52.8	1.7	4.8	93	Cust.	10				0	4.0	
5	79 8	8 52	NE_bN	1.5	53.0	1.9	4.8	91	Cust.	10			SW	1	4.3	
6	79 3	8 32	SW_bS	0.1	52.9	2.1	5.0	93	Cust.	10			SW	1	4.3	
7	78 57	8 10	NE_bN	1.4	53.2	2.6	4.7	84	Cust.	10			SW	1	4.6	
8	78 51	7 48	NNE	1.8	53.2	3.2	4.5	78	Cust.	10			SW	1	4.3	⊙
9	78 44	7 46		0.0	53.3	3.2	4.5	78	Cust.	10				0	4.3	
10	78 44	7 53	N_bE	4.3	53.3	2.8	4.7	84	Cust.	10	●^{o}		NE	1	4.2	
11	78 43	8 20	NNE	4.8	53.7	3.2	5.0	87	Cust.	7			NW	1	4.6	
12	78 43	8 38	N	3.8	53.6	3.6	4.8	82	Cust.	7			NW	1	4.0	
1p.m.	78 42	8 45	N_bW	3.8	53.6	3.6	4.9	83	Cust.	6			NW	1	4.4	
2	78 42	8 37	N	3.4	53.6	3.7	4.9	82	Cust.	9			WNW	1	4.4	Water blue, a little greenish.
3	78 42	8 37	NNE	3.0	53.4	3.6	4.9	83	Cust.	9			WNW	1	4.4	
4	78 42	8 37	N_bE	3.8	53.4	3.2	5.2	90	Cust.	10			WNW	1	4.4	
5	78 42	8 40	N_bW	5.2	53.7	2.9	5.1	90	Cust.	10			WNW	1	4.0	
6	78 37	9 3	N_bW	5.2	53.8	2.9	4.8	85	Cust.	10			WNW	1	4.4	
7	78 33	9 28	N_bW	5.4	53.7	2.6	5.1	93	Cust.	10			WNW	1	4.7	
8	78 28	9 52	N_bW	5.2	53.6	2.4	5.1	93	Cust.	10	●^{o}		WNW	1	4.4	*d.*
9	78 23	10 19	NNW	5.1	54.0	3.5	5.1	87	Cust.	10			WNW	1	4.2	
10	78 19	10 45	NW_bN	4.6	53.9	3.3	4.8	83	Cust.	10			WNW	1	4.2	
11	78 15	11 11	NW_bN	4.9	53.9	2.6	5.1	93	Cust.	10			WNW	1	4.2	
12	78 11	11 40	NW_bW	5.7	54.0	2.4	5.1	93	Cust.	10	●^{o}		WNW	1	4.2	*d.*

1878. August 19.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	78 7	12 9 E	NW_bN	5.3	753.9	2.0	4.9	93	Cust.	10			WNW	1	4.1	
2	78 7	12 35	NNW	5 3	53.5	2.4	4.8	87	Cust.	10			WNW	1	4.0	
3	78 7	13 2	NNW	3.4	53.6	2.6	4.9	89	Cust.	10			WNW	1	3.6	
4	78 8	13 23	NNW	.9	53.5	2.7	4.9	87	Cust.	10			WNW	1	3.5	
5	78 8	13 42	NW_bW	5.1	53.4	2.4	5.1	93	Cust.	10	●^{o}		WNW	1	4.2	*d.*
6	78 8	13 45	W_bS	3.9	53.5	2.6	5.0	91	Cust.	10			NW	1	4.2	⊙
7	78 8	13 48	WNW	2.2	53.7	2.5	5.0	91	Cust.	10	●^{o}		W	1	4.3	
8	78 8	13 51	NW_bN	3.5	53.7	2.3	4.8	87	Cust.	10			WNW	1	4.1	Ice-Fjord.
9	78 9	14 12	W	3.4	54.2	3.0	4.7	83	Cust.	10			WNW	1	4.1	
10	78 9	14 20	W	4.9	54.3	2.9	4.6	80	Cust.	10			WNW	1	4.0	
11	78 10	14 26	NW_bW	7.0	54.4	2.8	4.5	79	Cust.	10			NW	1	4.0	
12	78 12	14 45	W_bS	5.7	54.4	3.0	4.7	83	Cust.	10			WNW	1	4.4	
1p.m.	78 14	15 10	W_bS	5.6	54.3	3.4	4.9	83	Cust.	10			W	1	4.4	
2	78 16	15 31	W_bN	7.7	54.1	3.0	4.3	76	Cust.	9	✱^{o}			0	4.4	
3	78 14	15 40	W_bN	7.2	54.0	3.0	4.3	76	Cust.	7				0	4.4	
4	Advent Bay.		W_bN	7.0	53.8	2.9	4.3	76	Cust.	9				0	4.4	✱*p.*
5	Ice Fjord.		W_bN	3.6	53.8	3.1	5.1	90	Cust.	6				0	4.2	
6	Spitzbergen.		NW	2.6	53.8	2.8	4.7	82	Cust.	9				0	4.3	
7			NE	2.0	53.8	2.2	4.7	87	Cust.	9				0	4.3	
8			N_bE	1.0	54.2	2.5	4.5	80	Gust.	9				0	4.2	
9			N_bW	3.0	54.3	2.3	4.6	84	Cust.	9				0	4.1	
10			N_bW	0.0	54.3	2.2	4.5	84	Cust	9				0	4.2	
11				0.0	54.3	2.0	4.3	82	Cust.	9				0	4.1	
12				0.0	54.3	1.9	4.4	84	Cust.	9				0	4.1	

1878. August 20.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1a.m.	Advent Bay.			0.0	754.3	1.8	4.5	85	Cust.	10				0	4.2	
2				0.0	54.3	1.8	4.5	85	Cust.	10				0	4.1	
3				0.0	54.2	1.8	4.5	85	Cust.	10				0	4.1	
4				0.0	54.2	1.9	4.4	84	Cust.	10				0	4.0	
5				0.0	54.1	1.9	4.5	86	Cust.	10				0	4.1	
6				0.0	54.2	2.2	4.4	82	Cust.	10				0	4.0	
7			E$_b$S	2.1	54.2	3.0	4.3	76	Cust.	7				0	4.0	
8			E$_b$S	2.4	54.2	3.1	4.3	74	Cust.	9				0	4.0	
9			E$_b$S	2.6	53.9	3.0	4.7	83	Cust.	9				0	4.1	
10			E$_b$S	4.8	53.9	2.9	4.8	85	Cust.	8				0	4.0	
11			W$_b$N	5.7	53.7	2.9	4.7	82	Cust.	10				0	4.2	
12			W$_b$N	6.1	53.8	2.9	4.8	85	Cust.	10				0	4.3	
1p.m.			W$_b$N	6.6	53.7	2.6	4.6	82	Cust.	10				0	4.3	⊙
2			W$_b$N	6.7	53.6	2.6	4.6	82	Cust.	10				0	4.2	
3			W$_b$N	5.6	53.5	2.5	4.7	84	Cust.	8				0	4.4	
4			W$_b$N	6.3	53.2	2.4	4.8	87	Cust.	9				0	4.3	
5			W$_b$N	5.7	53.1	2.4	4.7	85	Cust.	8				0	4.3	
6			W$_b$N	5.0	53.1	2.1	4.7	87	Cust.	8				0	4.0	
7			WNW	4.8	52.7	2.0	4.7	89	Cust.	8				0	4.0	
8			WNW	5.1	52.7	1.9	4.7	90	Cust.	10				0	4.0	
9			WNW	4.8	52.7	1.8	4.8	91	Cust.	10				0	4.0	
10			WNW	3.7	52.8	1.6	4.9	94	Cust.	10				0	4.0	
11			WNW	3.5	52.8	1.7	4.8	93	Cust.	9				0	4.0	
12				0.0	52.5	1.6	4.9	94	Cust.	8				0	4.0	

1878. August 21.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1a.m.	Advent Bay.			0.0	752.3	1.6	4.8	93	Cust.	10 ✱				0	4.8	
2				0.0	52.3	1.3	4.8	94	Cust.	10				0	4.6	
3				0.0	52.0	1.4	4.7	93	Cust.	10				0	4.6	
4				0.0	52.1	1.4	4.7	93	Cust.	10				0	4.4	
5			SSE	1.9	52.3	1.6	4.6	89	Cust.	10				0	4.4	
6			SSE	1.7	52.3	1.6	4.6	89	Cust.	10				0	4.4	
7			ESE	1.6	51.1	2.3	4.2	77	Cust.	10				0	4.1	
8			SSE	2.0	51.4	2.7	4.3	77	Cust.	10 ✱^{o}				0	4.2	
9			SE$_b$S	1.5	51.0	2.8	4.3	75	Cust.	10				0	4.2	
10			ESE	2.3	51.3	3.0	5.3	93	Cust.	10				0	4.4	
11				0.0	51.1	3.2	4.8	83	Cust.	10				0	4.6	
12				0.0	50.9	3.4	4.5	76	Cust.	4				0	4.6	
1p.m.			N$_b$W	2.9	50.6	3.4	4.5	76	Ci.	2				0	4.6	
2			N$_b$W	2.4	50.6	3.4	4.5	76	Ci.	10				0	4.6	
3			N$_b$W	2.4	50.5	3.4	4.5	76	Cust. Ci.	10				0	4.4	
4			NW$_b$W	2.5	50.4	3.0	5.5	96	Cust.	10				0	4.4	
5			NW$_b$W	2.6	50.1	3.0	5.5	96	Cust.	10				0	4.2	
6			NW	2.3	50.0	3.2	5.0	87	Cust.	10				0	4.0	
7				0.0	49.7	3.0	4.9	87	Cust.	10				0	4.0	
8				0.0	49.8	3.0	4.9	87	Cust.	10				0	4.6	
9				0.0	49.7	2.8	4.7	82	Cust.	10				0	4.6	
10				0.0	49.8	2.8	5.0	89	Cust.	10				0	4.4	
11				0.0	49.7	3.0	5.1	90	Cust.	8				0	4.4	
12				0.0	49.7	3.0	4.9	87	Cust.	10				0	4.4	⊙

1878. August 22.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks
1a.m.	Advent Bay.			0.0	749.7	2.8	5.0	89	Cust.	10				0	4.5	
2				0.0	49.6	2.7	5.0	89	Cust.	10				0	4.5	
3				0.0	49.6	2.8	5.0	89	Cust.	10				0	4.6	
4				0.0	49.5	2.9	5.2	91	Cust.	10				0	4.6	
5				0.0	49.5	3.4	5.1	87	Cust.	10				0	4.6	
6				0.0	49.4	3.4	5.1	87	Cust.	10				0	4.6	
7				0.0	49.3	3.6	5.3	90	Cust.	10				0	4.2	
8				0.0	49.4	3.6	5.3	90	Cust.	10				0	4.2	
9			NW$_b$N	2.4	49.6	4.2	5.2	85	Cust.	10				0	4.6	
10			NW	1.7	49.7	4.2	5.4	87	Cust.	10				0	4.7	
11			NW$_b$N	3.1	49.6	4.0	5.5	90	Cust.	8				0	4.8	
12			NW$_b$N	4.8	49.6	4.0	5.5	90	Cust.	10				0	4.8	
1p.m.			NW$_b$N	3.0	49.5	3.6	4.7	80	Cust.	10				0	4.8	
2			NW	3.1	49.5	3.6	4.8	82	Cust.	10				0	4.8	
3			NW$_b$W	3.3	49.4	3.6	4.8	82	Cust.	10				0	4.7	
4			NW	4.0	49.6	3.6	4.9	83	Cust.	10				0	4.8	
5			NW$_b$W	3.6	49.5	3.0	5.1	90	Cust.	10				0	4.8	
6			NW$_b$N	3.2	49.5	3.0	5.0	88	Cust.	10				0	4.7	At 6.15, left Advent Bay.
7	78° 16′	15° 38′ E	NW$_b$N	2.1	49.7	3.5	5.0	85	Cust.	10				0	4.6	
8	78 15	15 30	WSW	0.3	49.8	3.4	5.0	85	Cust.	10 ●^{o}				0	4.7	*d.*
9	78 13	15 8	SW	1.3	49.7	2.7	5.1	91	Cust.	10 ●^{o}				0	4.4	*d.*
10	78 11	14 34	W$_b$S	2.5	49.8	2.8	4.7	82	Cust.	10				0	4.4	
11	78 9	14 6	WSW	3.1	50.0	2.4	4.7	85	Cust.	10				0	4.0	
12	78 6	14 38	SW$_b$W	2.7	50.1	2.4	4.9	89	Cust.	10				0	3.6	

1878. August 23.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	78° 0′	13° 27′ E	S	0.5	749.9	2.5	4.7	85	Cust.	10			W	1	3.6	
2	77 53	13 22	SE$_b$E	2.0	49.8	2.2	4.8	89	Cust.	10	●°		W	1	3.4	*d.*
3	77 46	13 18	S	1.4	49.9	2.2	4.8	89	Cust.	10			W	1	3.4	
4	77 39	13 14	S	1.6	49.7	2.3	4.9	89	Cust.	10	●°		W	1	3.3	
5	77 33	13 11	S	2.0	49.7	2.2	5.1	94	Cust.	10	●°		W	1	3.3	*d.*
6	77 27	13 9	SW$_b$S	4.9	49.2	2.2	5.2	96	Cust.	10			SW	1	3.6	*d*; ∗*p.*
7	77 21	13 6	SW$_b$S	5.0	48.8	2.2	5.2	96	Cust.	10			SW	1	3.6	
8	77 15	13 3	SW$_b$S	3.2	49.1	2.6	5.3	96	Cust.	10			SW	1	3.8	
9	77 9	12 59	SE$_b$E	3.5	49.2	2.8	5.4	96	Cust.	10		0.9	ESE	1	3.5	⊙
10	77 3	13 9	S$_b$E	3.0	49.2	2.6	5.2	94	Cust.	10			ESE	1	3.4	
11	76 57	13 19	SSW	4.2	49.3	2.5	5.0	91	Cust.	10	●°		ESE	1	4.2	*d.*
12	76 51	13 28	W$_b$S	4.1	49.3	2.8	5.0	89	Cust.	10	●°		ESE	1	3.4	*d.*
1p.m.	76 44	13 35	SW$_b$W	5.2	49.3	3.0	5.1	90	Cust.	10	●°		ESE	1	5.0	
2	76 38	13 43	SE$_b$E	1.3	49.0	3.2	5.0	87	Cust.	10			ESE	1	5.0	
3	76 31	13 50	E$_b$S	0.8	48.8	3.2	5.2	90	Cust.	10			WNW	1	4.6	
4	76 24	13 57	SE$_b$S	0.9	48.7	3.8	5.4	90	Cust.	10			WNW	1	4.8	
5	76 18	14 5	SE$_b$S	0.7	48.6	3.9	5.2	85	Cust.	10			WNW	1	4.8	
6	76 12	14 13	E$_b$N	0.2	48.6	3.6	5.3	90	Cust.	10			WNW	1	6.1	*d.*
7	76 6	14 21	SW$_b$W	6.4	48.5	3.4	5.4	93	Cust.	10			WNW	1	5.4	
8	76 0	14 30	SW$_b$S	5.7	48.4	4.0	5.5	90	Cust.	10	∗		WNW	1	5.0	∗*p.*
9	75 53	14 39	SW$_b$W	4.7	48.5	3.5	4.9	83	Cust.	10	∗		WNW	1	5.0	∗*p.*
10	75 46	14 47	SW	3.9	48.5	3.6	4.7	80	Cust.	10			WNW	1	4.8	
11	75 38	14 55	N	1.0	48.3	3.4	5.2	90	Cust.	10			NW	1	4.7	
12	75 30	15 3	SE$_b$S	5.2	48.2	3.6	5.3	90	Cust.	10			WNW	1	4.9	

1878. August 24.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	75 30	15 5 E	S	2.3	748.2	3.6	5.4	92	Cust.	10			WNW	1	4.9	
2	75 24	15 13	SE$_b$S	3.2	47.8	3.2	5.4	93	Cust.	10			SE	1	4.8	
3	75 18	15 21	SE$_b$S	5.5	47.6	3.2	5.3	92	Cust.	10			SE	2	4.8	
4	75 12	15 29	SE$_b$S	6.1	47.4	3.3	5.3	92	Cust.	10			SE	2	5.0	
5	75 6	15 36	ESE	8.2	47.0	2.8	5.2	93	Cust.	10			SE	2	5.3	
6	75 1	15 43	ESE	8.5	46.4	2.9	5.2	91	Cust.	10			SE	2	5.4	
7	74 55	15 49	ESE	9.0	46.2	2.9	5.2	93	Cust.	10			SE	2	6.2	
8	74 49	15 55	E$_b$S	11.4	45.9	2.7	5.3	94	Cust.	10			SE	2	4.5	
9	74 44	16 0	E$_b$S	10.0	45.5	2.4	5.1	93	Cust.	10			SE	3	5.0	
10	74 39	16 5	E$_b$S	8.8	45.1	2.6	5.3	96	Cust.	10			SE	3	6.8	
11	74 34	16 11	E$_b$S	9.0	44.4	2.8	5.4	96	Cust.	10			SE	3	5.8	
12	74 33	16 13	E$_b$S	9.1	44.0	3.0	5.4	95	Cust.	10			ESE	3	6.2	
1p.m.	74 27	16 19	E$_b$S	10.5	43.5	3.4	5.4	97	Cust.	10			ESE	3	6.2	
2	74 22	16 25	E$_b$N	9.0	43.3	3.6	5.9	00	Cust.	10	●°		E	3	6.9	
3	74 17	16 31	ENE	10.4	42.5	4.0	6.0	98	Cust.	10	●°		E	3	7.2	
4	74 12	16 38	ENE	10.0	42.4	4.0	6.0	98	Cust.	10	●°		E	3	7.2	
5	74 5	16 46	NE$_b$E	11.3	42.1	3.9	5.9	97	Cust.	10	●°		NE	3	7.4	
6	74 0	16 51	NE	11.8	42.1	3.1	5.5	96	Cust.	10	●°		NE	4	7.4	
7	73 54	16 56	NE$_b$N	11.2	42.2	2.9	5.4	96	Cust.	10	●		NE	4	6.9	
8	73 48	17 2	NE$_b$N	13.3	42.3	3.2	5.6	97	Cust.	10	●°		NE	4	7.5	
9	73 42	17 9	NNE	14.8	42.8	3.4	5.4	93	Cust.	10			NE	4	7.4	
10	73 35	17 15	N	16.5	43.2	3.4	5.6	97	Cust.	10	●°		NNE	4	7.4	
11	73 28	17 21	N	17.4	43.8	4.4	5.4	87	Cust.	10			NNE	5	7.4	
12	73 21	17 27	N	15.0	45.2	4.2	6.0	97	Cust.	10			N	5	7.4	

1878. August 25.

h	φ	λ	a	W	b	t	e	r	n	q	p	o	u	g	τ	Remarks.
1a.m.	73 15	17 35 E	N$_b$E	15.0	746.5	3.9	5.7	93	Cust.	10			N	5	7.7	
2	73 8	17 42	N	12.0	48.1	4.5	5.8	92	Cust.	10			N	5	7.8	
3	73 0	17 50	N	12.4	49.0	4.9	5.6	86	Cust.	8			N	5	8.0	
4	72 52	17 57	N	12.2	50.3	4.9	5.5	84	Cust.	8			N	6	8.0	
5	72 45	18 3	N	12.0	51.0	5.2	5.6	84	Cust.	6			N	6	8.0	
6	72 38	18 10	N	11.2	52.7	5.4	5.6	83	Cust.	5			N	6	8.0	
7	72 31	18 17	N	10.7	52.5	6.4	6.3	88	Cust.	10			N	6	8.0	
8	72 23	18 24	N	10.8	53.9	6.2	5.8	82	Cust.	10			N	6	8.0	
9	72 16	18 31	N$_b$W	9.9	55.3	6.4	5.9	83	Cust.	10			N	6	8.4	
10	72 9	18 38	N$_b$W	9.5	56.2	6.4	5.9	83	Cust.	10			N	6	8.6	Swell from W.
11	72 2	18 45	NNW	7.3	56.6	7.2	6.3	83	Cust.	8			N	6	8.8	
12	71 56	18 52	NNW	7.6	57.4	7.4	5.5	72	Cust.	8			NNW	5	8.6	
1p.m.	71 51	18 58	NNW	7.5	57.6	7.0	5.3	71	Cust.	8			NNW	5	8.3	Swell from WNW.
2	71 45	19 3	NW$_b$N	7.5	58.0	6.8	5.5	74	Cust. Cu. Ci.	4			NNW	4	8.4	
3	71 39	19 8	NNW	7.7	58.6	7.2	5.6	74	Cust. Cu.	7			NNW	4	8.4	
4	71 32	19 13	NNW	8.1	58.9	6.9	5.8	79	Cust. Cu.	8			N	4	8.4	
5	71 25	19 19	NW$_b$N	8.6	59.6	7.1	5.4	71	Cust. Cu.	3			NNW	4	8.4	
6	71 18	19 26	NW	9.1	59.8	7.2	5.4	72	Cust. Cu.	3			NNW	4	8.4	
7	71 11	19 33	NW$_b$N	7.6	60.0	7.2	5.6	74	Cust. Cu.	3			NNW	4	8.4	
8	71 4	19 40	NNW	8.1	60.4	6.4	5.9	83	Cust.	7			NNW	4	8.4	
9	70 58	19 45	NW	6.6	60.3	6.2	6.0	85	Cust.	8	●°		NNW	4	8.4	
10	70 52	19 50	NW	6.6	60.6	7.0	6.0	79	Cust.	8			NNW	4	8.4	
11	70 45	19 57	NW	6.3	61.1	6.8	6.1	82	Cust.	8			NNW	3	8.7	
12	70 39	20 3	W$_b$N	6.6	61.2	6.8	6.0	81	Cust.	9		0.0	NW	3	8.6	

Jan Mayen. For 1878 Aars Vedkommende maatte Grupperingen tildels blive noget forskjellig for de forskjellige Elementer, idet der i enkelte af de forsøgte Grupper ikke viste sig Spor af nogen rimelig Periode. De Hensyn, som ligge til Grund for de valgte Grupper, skulle paa sit Sted blive forklarede.

I hver af de valgte Grupper er der kun medtaget hele Observationsdage, det vil sige saadanne, paa hvilke der er blevet observeret alle 24 Timer i Døgnet, regnet fra Midnat til Midnat.

Førend de valgte Gruppers Middeltal for de enkelte Klokkeslet ere anvendte til Beregningen af Formlerne for de daglige Perioder, ere de blevne corrigerede for Virkningen af de uperiodiske Variationer og den aarlige Forandring samt Stedforandring af Observationspunktet (Skibet). Da hver Gruppe i Regelen udgjøres af flere mindre, adskilte fra hinanden ved de Dage, Expeditionen laa i Havn, ere disse Correctioner beregnede først særskilt for hver af de mindre, sammenhængende Afdelinger, og deres Medium, Hensyn taget til Dagenes Antal, anbragt ved de større Gruppers Medier. Med Hensyn til Methodens Anvendelse henvises til H. Wild, Die Temperaturverhältnisse des Russischen Reiches.[1] Erste Hälfte. Side 9, og til de under hver Gruppe nedenfor givne Oplysninger.

Som ovenfor i denne Afhandling (Side 46) nævnt, udførtes de timevise Observationer efter Skibsuret, der stilledes paa 12 hver Middag sand Tid. Ved Skibets Sejlads vestover eller østover svarede saaledes Observationstiderne ikke ganske til sand Tid paa Skibets paaværende Plads. Afvigelserne, der voxe med Tiden, naaede sin største Værdi den næste Dags Middag, forudsat, som Tilfældet uden mange Undtagelser — Se Kartet over Vøringens Route — var, at i Mellemtiden Længden var alene voxet eller aftaget.

At indføre nogen Correction af de beregnede Middeltal for Observationsklokkeslettene for at bringe dem i Overensstemmelse med den sande Tid paa Stedet kunde vistnok lade sig gjøre ved Interpolation mellem Værdierne for de enkelte Timer. Men en saadan Fremgangsmaade vilde neppe lønne Umagen. I ethvert Tilfælde bliver man afhængig af den Variation, som selve Skibets Stedforandring medfører. Betragter man de daglige Perioder, som resultere af vore Beregninger, saa ser man, at det mest fremtrædende Træk er Amplitudernes Lidenhed. De absolute Værdiers Variation med Tiden indenfor den daglige Periode bliver saaledes kun ringe, og en mindre Fejl i Klokkeslettet har liden eller ingen praktisk Betydning ligeoverfor Observationens absolute Nøjagtighed. Hertil kommer endvidere, som jeg nedenfor for hver Gruppe skal vise, at Fejlen i Klokkeslettet for de enkelte Observationer compenseres næsten aldeles fuldstændigt ved den Omstændighed, at Summen af

[1] Supplementband zum Repertorium für Meteorologie. St. Petersburg 1877.

other those taken within the Greenland Polar current and during the stay of the Expedition at the Island of Jan Mayen. As regards 1878, this grouping had to be varied for the different elements, some of the groups I tried to form not having exhibited even traces of an admissible period. The various reasons that affected me in forming the groups, will be explained in the sequel.

For each of the groups selected, none but whole "observation days" have been taken, that is to say, such on which we observed every hour of the four and twenty, from midnight to midnight.

Before applying the mean values of the groups for each individual hour to compute the formulæ for the diurnal periods, they were corrected for the effect of the non-periodic variation, as also for the annual change and the change in the place of observation (ship's position). Each group comprising as a rule several smaller ones, separated one from the other by the interval passed by the Expedition in harbour, these corrections were first computed separately for each of the smaller continuous sections, and their mean —, regard being had to the number of days — applied to the means of the greater groups. With respect to the application of the method, the reader is referred to H. Wild, Die Temperaturverhältnisse des Russischen Reiches,[1] Erste Hälfte, p. 9, and likewise to the information given under each group in the sequel.

As previously stated in this Memoir (p. 46), the hourly observations were taken by the ship's clock, which every day at noon was set to apparent solar time. Hence, with the vessel steaming westward or eastward, the hours of observation did not correspond exactly with apparent time on board. The difference, continually increasing, reached its maximum the next day at noon, provided, as was actually the case without many exceptions, — see Plate showing the track of the Vøringen, — that in the meantime the longitude had only increased or diminished.

To introduce a correction of the computed means for the hours of observation, in order to make the latter correspond with the apparent time of the ship's position, might indeed be effected by means of interpolation between the values for the different hours. But this would hardly be worth the trouble. In any case, the results would still be affected by the variation involved in the change of position of the ship herself. If we regard the diurnal periods resulting from our computations, the most salient feature is found to be the smallness of the amplitudes of variation. Hence, the hourly variation of the absolute values within the diurnal period will be but trifling, and a slight error in the hour for the different observations is of little or no practical importance as compared with the absolute accuracy of the observations. And moreover, as will be shown below for each group, the error in the hour of the different observations is almost wholly compensated by the sum of the

[1] Supplementband zum Repertorium für Meteorologie. St. Petersburg 1877.

I den følgende Redegjørelse er hvert af de meteorologiske Elementer behandlede for sig, i Ordenen: Luftens Tryk, Luftens Temperatur, Vanddampenes Tryk, Relativ Fugtighed, Vindens Hastighed og Havfladens Temperatur.

In the following account each of the meteorological elements has been treated separately, in the order: — Pressure of air, temperature of air, force of vapour, relative humidity, velocity of wind, and temperature of sea-surface.

I. Lufttryk.

1876.

Følgende hele Observationsdage ere anvendte:

Juni 28 til Juli 8, 11 Dage. Rejsen fra Christianssund til Færøerne (Thorshavn).

Juli 17 til Juli 26, 10 Dage. Rejsen fra Færøerne til Island (Reykjavik).

Aug. 4 til Aug. 13, 10 Dage. Rejsen fra Island til Norge (Halten).

Disse Dage repræsentere et meget uroligt Vejr, med sterk Vind, høj Sø og tyk Luft paa Havet mellem Island og Norge, mellem Bredderne 62° og 65°. Antallet af Dage er tilsammen 31.

I. Pressure of the Air.

1876.

The following is the number of whole observation days: —

June 28 to July 8, 11 days; on the passage from Christianssund to the Færoes (Thorshavn).

July 17 to July 26, 10 days; on the passage from the Færoes to Iceland (Reykjavik).

Aug. 4 to Aug. 13, 10 days; on the passage from Iceland to Norway (Halten).

On these days the Expedition encountered very boisterous weather, with high winds, a rough sea, and a foggy atmosphere, throughout the tract of ocean between Iceland and Norway, in latitude 62° to 65°. The total number of days was 31.

Den *(on the)* 27 Juni *(of June)*,	12 p.m.	var Lufttrykket *(the pressure was)*	758.^{mm}7.
„ „ 8 Juli *(of July)*,	„	„ „ „	750.^{mm}8.
Forskjel *(Difference)*			7.^{mm}9 : 11 = 0.^{mm}72 = *c.*[1]
Den *(on the)* 16 Juli *(of July)*,	12 p.m.	var Lufttrykket *(the pressure was)*	760.^{mm}3.
„ „ 26 „ „	„	„ „ „	747.^{mm}1.
Forskjel *(Difference)*			13.^{mm}2 : 10 = 1.^{mm}32 = *c.*
Den *(on the)* 3 August,	12 p.m.	var Lufttrykket *(the pressure was)*	749.^{mm}5.
„ „ 13 „	„	„ „ „	763.^{mm}8.
Forskjel *(Difference)*			— 14.^{mm}3 : 10 = — 1.^{mm}43 = *c.*

Correctionen for den hele Gruppe = (7.9 + 13.2 — 14.3) : 31 = 6.8 : 31 = 0.^{mm}219 eller pr. Time, regnet fra Middag = 0.219 : 24 = 0.^{mm}009.

Fejlen i Observationsklokkeslettet Kl. 12 Middag, hidrørende fra Længdeforandring af Fartøjet, er størst den 5te August, da den gaar op til + 27^{m}, næststørst den 22de Juli, da den er — 20.^{m}5. Dette er i begge Tilfælder under Sejladsen langs Islands Sydkyst. Summen af positive Fejl er 149.^{m}5, fordelt paa 14 Dage, eller pr. Dag 10.^{m}7. Summen af negative Fejl er — 142.^{m}8, fordelt paa 15 Dage, eller pr. Dag — 9.^{m}5. Den algebraiske Sum, 6.^{m}7, fordelt paa 31 Dage, giver for Middagsobservationen en gjennemsnitlig Fejl i Klokkeslettet efter sand Soltid + 0.^{m}22, det er Klokken er paa Stedet 13 Secunder mere end antaget efter Skibsuret. Denne Afvigelse er forsvindende i Forhold til den Nøjagtighed, hvormed Tiden for en meteorologisk

[1] Wild op. cit. Side 9.

The correction for the whole group = (7.9 + 13.2 — 14.3): 31 = 6.8 : 31 = 0.^{mm}219, or, per hour, taken from noon, = 219 : 24 = 0.^{mm}009.

The error in the hour of observation at noon, occasioned by the change in the longitude of the vessel, was greatest on the 5th of August, when it reached + 27^{m}; the next greatest error occurring on the 22nd of July, when it was — 20.^{m}5. Both of these cases occurred when the Expedition was steaming along the south coast of Iceland. The sum of the positive errors is 149.^{m}5, distributed over 14 days, or 10.^{m}7 per day. The sum of the negative errors amounts to — 142.^{m}8, distributed over 15 days, or — 9.^{m}5 per day. The algebraic sum, 6.^{m}7, distributed over 31 days, gives for the midday observation an average error in the hour by apparent solar time of + 0.^{m}22, i. e. local time 13 seconds in advance of the ship's clock. This difference

[1] Wild op. cit. p. 9.

Ialt 34 Dage, mellem Bredderne 66° og 71°, med meget roligt og tildels smukt Vejr.

Total 34 days, betwen 66° and 71° N. lat., frequently with good, and occasionally with fine weather.

Den *(on the)* 16 Juni *(of June)*, 1^h a.m. var Lufttrykket *(the pressure was)*: 768.^{mm}1.
" " 23 " " " " " 748.^{mm}2.
Forskjel *(Difference)* 19.^{mm}9 : 7 = 2.^{mm}84 = *c*.

Den *(on the)* 28 Juni *(of June)*, 12^h p.m. var Lufttrykket *(the pressure was)*: 759.^{mm}1.
" " 30 " " " " " 755.^{mm}3.
Forskjel *(Difference)* 3.^{mm}8 : 2 = 1.^{mm}90 = *c*.

Den *(on the)* 3 Juli *(of July)* 1^h a.m. var Lufttrykket *(the pressure was)*: 755.^{mm}1.
" " 8 " " " " " 759.^{mm}5.
Forskjel *(Difference)* —4.^{mm}4 : 5 = — 0.^{mm}88 = *c*.

Den *(on the)* 16 Juli *(of July)* 1^h a.m. var Lufttrykket *(the pressure was)*: 760.^{mm}5.
" " 20 " " " " " 759.^{mm}5.
Forskjel *(Difference)* 1.^{mm}0 : 4 = 0.^{mm}25 = *c*.

Den *(on the)* 25 Juli *(of July)* 1^h a.m. var Lufttrykket *(the pressure was)*: 755.^{mm}9.
" " 10 Aug. " " " 760.^{mm}3.
Forskjel *(Difference)* —4.^{mm}4 : 16 = —0.^{mm}27 = *c*.

For den hele Gruppe bliver $c = + 0.^{mm}464$.

Fejlen i Observationsklokkeslettet ved Middag har sin største Værdi — 35.^{m}2 den 25de Juli under Sejladsen fra Tromsø til Jan Mayen og sin næststørste, + 23.^{m}3 den 7de Juli. Summen af positive Fejl er 198.^{m}3, fordelt paa 17 Dage, eller pr. Dag 11.^{m}6. Summen af negative Fejl er — 199.^{m}7, fordelt paa 15 Dage, eller pr. Dag — 13.^{mm}3. Den gjennemsnitlige Fejl bliver — 1.^{m}4 fordelt paa 34 Dage (2 Dage til Ankers under Jan Mayen) eller — 0.^{m}04. Compensationen er fuldstændig.

For the whole group, $c = + 0.^{mm}464$.

The error in the hour of observation at noon reached its greatest value, — 35.^{m}2, the 25th of July, on the passage from Tromsø to Jan Mayen, and its next greatest, + 23.^{m}3, July 7th. The sum of the positive errors is 198.^{mm}3, distributed over 17 days, or 11.^{m}6 per day. The sum of the negative errors is — 199.^{m}7, distributed over 15 days, or — 13.^{m}3 per day. The average error is accordingly — 1.^{m}4, distributed over 34 days (2 days at anchor off the coast of Jan Mayen), or — 0.^{m}04. The compensation is perfect.

a. m.

Klokkeslet	1^h	2^h	3^h	4^h	5^h	6^h	7^h	8^h	9^h	10^h	11^h	12^h	Hour.
Corr. Obs.media	759.35	59.24	59.26	59.15	59.19	59.19	59.26	59.36	59.30	59.34	59.44	59.52	Corr. obs. means.
Afv. fra Dagsmedium	—0.11	—0.22	—0.20	—0.31	—0.27	—0.27	—0.20	—0.10	—0.16	—0.12	—0.02	0.06	Diff. from daily mean.
Beregnet Afvigelse	—0.09	—0.17	—0.26	—0.30	—0.29	—0.24	—0.18	—0.16	—0.14	—0.11	—0.03	0.07	Computed difference.
Forskjel: Obs.—Ber	—0.02	—0.05	0.06	—0.01	—0.02	—0.03	—0.02	0.06	—0.02	—0.01	0.01	—0.01	Diff.: obs. — comp.

p. m.

Corr. Obs.media	759.65	59.72	59.66	59.71	59.71	59.68	59.65	59.69	59.52	59.53	59.49	59.47	Corr. obs. means.
Afv. fra Dagsmedium	0.19	0.26	0.20	0.25	0.25	0.22	0.19	0.23	0.06	0.07	0.03	0.01	Diff. from daily mean.
Beregnet Afvigelse	0.17	0.23	0.24	0.24	0.23	0.23	0.21	0.17	0.11	0.06	0.02	—0.02	Computed difference
Forskjel: Obs. — Ber.	0.02	0.03	—0.04	0.01	0.02	—0.01	—0.02	0.06	—0.05	0.01	0.01	0.03	Diff.: obs. — comp.

Formel *(Formula)*: $b_t = 759.^{mm}46 - 0.^{mm}259 \sin (15^0\, 17'.2 + t) + 0.^{mm}016 \sin (76^0\, 43' + 2t)$
$+ 0.^{mm}026 \sin (135^0\, 0' + 3t) + 0.^{mm}028 \sin (21^0\, 3' + 4t)$.

Figuren Pl. I, Lufttryk 1877, viser, at den beregnede Curve stemmer meget godt overens med de observerede Værdier. MF $= \pm 0.^{mm}026$.

Efter Formelen beregnes:

The figure in Pl. I, Pressure of the Air, 1877, shows that the computed curve agrees very well with the observed values. MF $= \pm 0.^{mm}026$.

From the formula were computed —

Maximum $= + 0.^{mm}245$, $2^{h}\ 56^{m}$ p.m. Minimum $= - 0.^{mm}303$, $4^{h}\ 16^{m}$ a.m.

Medium: (*Mean*) $11^{h}\ 16^{m}$ a.m. og (*and*) $11^{h}\ 24^{m}$ p.m. Amplitude (*Total Range*): $0.^{mm}548$.

1878.

Følgende hele Observationsdage ere anvendte:

Juni 28 til Juli 7, 10 Dage. Rejsen i Østhavet. Vardø—Beeren Eiland—Hammerfest.

Juli 14 „ Juli 24, 11 „ Rejsen Hammerfest — Grønlandsisen — BeerenEiland.

Juli 30 „ Aug. 25, 27 „ „ Hammerfest—Beeren Eiland, Spidsbergen, Grønlandshavet.

Ialt 48 Dage, mellem Bredderne 71° og 80°, med tildels uroligt Vejr.

1878.

The following were the whole observation days: —

June 28 to July 7, 10 days; on the cruise in Barents' Sea; Vardø—Beeren Eiland—Hammerfest.

July 14 „ July 24, 11 days; Hammerfest — the Greenland ice — Beeren Eiland.

July 30 „ Aug. 25, 27 days; Hammerfest—Beeren Eiland, Spitzbergen, the Greenland Sea.

Total 48 days, in 71° to 80° N. lat., part of the time stormy weather.

Den (*on the*) 28 Juni (*of June*), 1^{h} a.m. var Lufttrykket (*the pressure was*) $749.^{mm}3$.
„ „ 8 Juli (*of July*), „ „ „ $753.^{mm}3$.
Forskjel (*Difference*) $-4.^{mm}0 : 10 = - 0.^{mm}40 = c$.

Den (*on the*) 13 Juli (*of July*), 12^{h} p.m. var Lufttrykket (*the pressure was*) $755.^{mm}8$.
„ „ 24 „ „ „ „ „ $751.^{mm}7$.
Forskjel (*Difference*) $4.^{mm}1 : 11 = 0.^{mm}37 = c$.

Den (*on the*) 29 Juli (*of July*), 12^{h} p.m. var Lufttrykket (*the pressure was*) $762.^{mm}3$.
„ „ 25 Aug. „ „ „ $761.^{mm}3$.
Forskjel (*Difference*) $1.^{mm}0 : 27 = 0.^{mm}04 = c$.

For den hele Gruppe bliver $c = + 0.^{mm}019$.

Fejlen i Observationsklokkeslettet ved Middag har sin største negative Værdi, $- 33.^{m}0$, den 8de August, og sin største positive Værdi, $+ 25.^{m}5$, den 15de August, paa 80° Bredde. Summen af positive Fejl er $269.^{m}3$, fordelt paa 19 Dage, eller pr. Dag $+ 14.^{m}2$. Summen af negative Fejl er $- 338.^{m}9$, fordelt paa 25 Dage, eller pr. Dag $- 13.^{m}5$. Den gjennemsnitlige Fejl bliver $- 69.^{m}6$, fordelt paa 48 Dage, eller pr. Dag $- 1.^{m}45$.

For the whole group, $c = + 0.^{mm}019$.

The error in the hour of observation at noon reached its greatest negative value, $- 33.^{m}0$, August 8th, and its greatest positive value, $+ 25.^{m}5$, August 15th, in 80° N. lat. The sum of the positive errors is $269.^{m}3$, distributed over 19 days, or $+ 14.^{m}2$ per day. The sum of the negative errors is $- 338.^{m}9$, distributed over 25 days, or $- 13.^{m}5$ per day. The average error is accordingly $- 69.^{m}6$, distubuted over 48 days, or $- 1.^{m}45$ per day.

a. m.

Klokkeslet	1^{h}	2^{h}	3^{h}	4^{h}	5^{h}	6^{h}	7^{h}	8^{h}	9^{h}	10^{h}	11^{h}	12^{h}	Hour.
Corr. Obs.media	753.95	53.84	53.71	53.63	53.61	53.64	53.58	53.70	53.78	53.87	53.97	54.11	Corr. obs. means.
Afv. fra Dagsmedium	0.02	—0.09	—0.22	—0.30	—0.32	—0.29	—0.35	—0.23	—0.15	—0.06	0.04	0.18	Diff. from daily mean.
Beregnet Afvigelse	0.01	—0.11	—0.21	—0.28	—0.32	—0.32	—0.30	—0.25	—0.16	—0.04	0.06	0.14	Computed difference.
Forskjel: Obs — Ber.	0.01	0.02	—0.01	—0.02	0.00	0.03	—0.05	0.02	0.01	—0.02	—0.02	0.04	Diff.: obs. — comp.

p. m.

Corr. Obs.media	754.10	54.14	54.11	54.16	54.13	54.10	54.01	54.02	54.06	54.09	54.05	54.02	Corr. obs. means.
Afv. fra Dagsmedium	0.17	0.21	0.18	0.23	0.20	0.17	0.08	0.09	0.13	0.16	0.12	0.09	Diff. from daily mean.
Beregnet Afvigelse	0.18	0.20	0.21	0.21	0.19	0.15	0.11	0.09	0.11	0.14	0.15	0.10	Computed difference.
Forskjel: Obs.—Ber.	—0.01	0.01	—0.03	0.02	0.01	0.02	—0.03	0.00	0.02	0.02	—0.03	—0.01	Diff.: obs. — comp.

Formel (*Formula*): $b_t = 753.^{mm}93 - 0.^{mm}244 \sin (8^0\, 49'.8 + t) + 0.^{mm}104 \sin (83^0\, 15' + 2t)$
$+ 0.^{mm}018 \sin (98^0\, 25' + 3t) + 0.^{mm}019 \sin (128^0\, 40' + 4t)$.

Figuren Pl. I, Lufttryk 1878, viser, at den beregnede Curve stemmer meget godt overens med de observerede Værdier. MF $= \pm\, 0.^{mm}019$.

Efter Formelen beregnes:

1 Maximum: $+ 0.^{mm}210$, $3^h\, 25^m$ p.m. 1 Minimum $- 0.^{mm}328$, $5^h\, 48^m$ a.m.
2 „ $+ 0.^{mm}145$, $10^h\, 41^m$ p.m. 2 „ $+ 0.^{mm}092$, $8^h\, 3^m$ p.m.

Medium indtræffer: $1^h\, 6^m$ a.m. og $10^h\, 23^m$ a.m.

Amplitude: $0.^{mm}538$.

Efter de observerede Værdier kunde muligens Morgen-Minimum lægges nærmere Kl. 7, f. Ex. $6^h\, 45^m$ a.m. og synke til $- 0.^{mm}34$, samt Aften-Maximum lægges ved $9^h\, 50^m$ p.m. og række $+ 0.^{mm}16$.

Af Figurerne Pl. I ser man, at den af vore timevise Observationer resulterende daglige Periode for Lufttrykket er i det Store taget meget lig i de forskjellige Aar eller paa de forskjellige Bredder. Minimum optræder med Bestemthed i Morgentimerne 3 til 6 og Maximum om Eftermiddagen, en Periode, der minder mere om Lufttemperaturens daglige Periode end om den sædvanlige Periode for Lufttrykket paa Land-Stationer og i det tropiske Atlanterhav. I 1876 og 1878 har Perioden 2 Slag, med et secundært Minimum om Eftermiddagen og et Maximum sent om Aftenen, noget som ogsaa antydes i Curven for 1877, der har en liden Sænkning ved 5 p.m.

Da de 3 Curver have saa stor Lighed, har jeg til et Forsøg beregnet følgende Mediums-Curve for de 3 Aar, idet hvert af disse er tillagt samme Vægt.

The figure in Pl. I, Pressure of the Air, 1878, shows that the computed curve agrees very well with the observed values. MF $= \pm\, 0.^{mm}019$.

From this formula are computed —

The Mean occurs $1^h\, 6^m$ a.m. and $10^h\, 23^m$ a.m.

Total Range: $0.^{mm}538$.

According to the observed values, the morning minimum might possibly be placed somewhat nearer 7 o'clock, for example $6^h\, 45^m$ a.m., and sink to $- 0.^{mm}34$, and the evening maximum be put at $9^h\, 50^m$ p.m. and reach to $+ 0.^{mm}16$.

From the figures in Pl. I, it will be seen that the diurnal period of pressure resulting from the hourly observations, is on the whole much the same in the different years or in the different latitudes. The minimum occurs invariably in the early morning hours from 3 to 6, and the maximum in the afternoon, a period having more in common with the diurnal period of the temperature of the air than with the usual period for pressure at land-stations and in the tropical parts of the Atlantic. For 1876 and 1878 the period has 2 waves, with a secondary minimum in the afternoon and a maximum late in the evening, which, indeed, is also indicated by the curve for 1877, that exhibits a slight depression at 5 p.m.

The 3 curves resembling one another so closely, I have computed the following mean curve for the 3 years, the same weight being attached to each.

a. m.

Klokkeslet	1^h	2^h	3^h	4^h	5^h	6^h	7^h	8^h	9^h	10^h	11^h	12^h	Hour.
Middel af obs. Værdier	−0.07	−0.18	−0.24	−0.30	−0.26	−0.21	−0.20	−0.09	−0.08	0.00	0.06	0.16	Mean of obs. values.
„ af beregnede „	−0.08	−0.17	−0.26	−0.29	−0.27	−0.22	−0.16	−0.12	−0.07	−0.01	0.07	0.15	„ of computed do.
Forskjel: Obs. — Ber.	0.01	−0.01	0.02	−0.01	0.01	0.01	−0.04	0.03	−0.01	0.01	−0.01	0.01	Diff.: obs. — comp.

p. m.

Klokkeslet	1^h	2^h	3^h	4^h	5^h	6^h	7^h	8^h	9^h	10^h	11^h	12^h	Hour.
Middel af obs. Værdier	0.23	0.25	0.20	0.21	0.16	0.13	0.07	0.08	0.04	0.07	0.05	0.00	Mean of obs. values.
„ af beregnede „	0.21	0.24	0.22	0.20	0.16	0.12	0.08	0.06	0.05	0.06	0.05	0.00	„ of computed do.
Forskjel: Obs. — Ber.	0.01	0.01	−0.02	0.01	0.00	0.01	−0.01	0.02	−0.01	0.01	0.00	0.00	Diff.: obs. — comp.

Middel af Forskjel, uden Hensyn til Fortegn $= \pm\, 0.^{mm}012$.

Værdierne ere afsatte i Figuren, Lufttryk 1876—77—78, Pl. I.

The mean of the difference, without regard to sign, $= \pm\, 0.^{mm}012$.

The values are set down in the figure, Pressure of the Air, 1876—77—78, Pl. I.

1878.	8 a.m.	2 p.m.	8 p.m.
Tromsø	— 0.07 mm	+ 0.11 mm	— 0.04 mm.
Gjesvær	— 0.32	+ 0.24	+ 0.07.
Vardø	— 0.04	+ 0.05	— 0.02.
Middel *(Mean)*	— 0.14	+ 0.13	0.00.
Expedition 1878	— 0.25	+ 0.19	+ 0.07.

Kysten og Expeditionen have fremdeles begge Minimum om Morgenen og Maximum om Eftermiddagen.

Tages Middeltallet for alle 3 Aar, faar man:

Both the coast-stations and the Expedition have still the minimum in the morning and the maximum in the afternoon.

If we take the mean of the 3 years, we get —

Norske Kyststationer	— 0.18 mm	+ 0.14 mm	+ 0.03 mm.	Norwegian Coast-Stations.
Expeditionen	— 0.17	+ 0.17	0.00.	Expedition.

Altsaa en særdeles nær Overensstemmelse. Denne Undersøgelse viser saaledes, at de ombord paa Expeditionen gjorte Barometeriagttagelser have ledet til en daglig Periode for Lufttrykkets Forandring, der har en reel Betydning: den stemmer overens med det samme Fænomens daglige Forandring paa Stationerne paa Kysten.

Dernæst har jeg undersøgt, hvorvidt den daglige Forandring af Lufttrykket paa Kysten rundt det norske Hav, som er iagttaget i de tre Sommere, da Expeditionen arbejdede i Søen, er overensstemmende med den, der fremgaar af en længere Observationsrække. Følgende Tabel, der er beregnet paa samme Maade som den ovenfor givne, viser Resultatet.

Accordingly a very close agreement. This investigation shows, therefore, that, from the barometrical observations taken at sea on the Expedition has been educed a diurnal period for the pressure of the air, to which a real value may be attached: it corresponds with the diurnal variation in the same phenomenon at the stations on the coast.

I next investigated whether the diurnal variation in the pressure on the coast of the Norwegian Sea observed on the three summer cruises of the Expedition, corresponds with that resulting from a longer series of observations. The following Table, computed in the same manner as that given above, shows the result.

Norske Kyst-Stationer. (*Norw. Coast-Stations*).	Aar (*Year*).		Middel af Juni, Juli og August. (*Mean for June, July, and August*). 8 a.m.	2 p.m.	8 p.m.
Vardø	13	1868—80	— 0.18 mm	+ 0.06 mm	+ 0.12 mm.
Tromsø	10	68—81	— 0.06	+ 0.02	+ 0.05
Bodø	13	68—80	— 0.10	+ 0.05	+ 0.04
Brønø	12	69—80	— 0.06	+ 0.08	— 0.03
Christiansund	20	61—80	— 0.11	+ 0.02	+ 0.09
Florø	11	69—80	— 0.10	+ 0.09	0.00
Bergen	20	61—80	— 0.11	+ 0.05	+ 0.07
Skudesnes	20	61—80	— 0.13	+ 0.08	+ 0.05
Mandal	20	61—80	— 0.06	+ 0.09	— 0.04
Middel (*Mean*)			— 0.10	+ 0.06	+ 0.04

Færøerne og Islands Østkyst. (*The Færoe Islands and East Coast of Iceland*)	Aar (*Year*)		8 a.m.	2 p.m.	9 p.m.
Thorshavn	6	1874—79	— 0.12 mm	0.00 mm	+ 0.13 mm.
Berufjord	6	74—79	— 0.20	— 0.03	+ 0.24
Middel (*Mean*)			— 0.16	— 0.02	+ 0.18

Østlandet.	Aar (*Year*).		8 a.m.	2 p.m.	8 p.m.
Dovre	16	1865—80	+ 0.24^{mm}	— 0.24^{mm}	— 0.01^{mm}.
Christiania	15	67—81	+ 0.44	— 0.16	— 0.28
Sandøsund	20	61—80	+ 0.19	+ 0.16	— 0.35

Efter Observationerne fra det astronomiske Observatorium i Christiania har Lufttrykket i Sommermaanederne et Maximum ved Kl. 9 Morgen og et Minimum ved Kl. 5—6 Eftermiddag. Natte-Maximum og Minimum falde bort. Den hele Amplitude er henimod 0.^{mm}9. Dovre synes at have en lignende Periode; i Sandøsund synes Morgenmaximum at falde noget senere, ialfald begynder den raske Synken først efter Kl. 2 Eftm. Vi møde her, navnlig i Christiania, den bekjendte periodiske Gang med en temmelig stor Amplitude. Stille vi Christiania og det norske Hav sammen, efter Afvigelserne fra Dagsmediet, faa vi følgende Tabel:

According to the observations taken at the Astronomical Observatory in Christiania, the pressure of the air in the summer months has a maximum at 9 o'clock in the morning and a minimum at 5 to 6 o'clock in the afternoon. The night maximum and minimum disappear. The total range is about 0.^{mm}9. Dovre would appear to have a similar period; at Sandøsund the morning maximum would appear to occur somewhat later; at all events, the rapid fall does not commence till after 2 o'clock in the afternoon. Here — particularly in Christiania — the known periodical variation has a rather large range. On comparing Christiania with the Norwegian Sea, as regards the deviations from the daily mean, we obtain the following Table: —

	2 a.m.	4	6	8	10	12	2 p.m.	4	6	8	10	12 p.m.
Christiania	+0.23	+0.26	+0.32	+0.35	+0.32	+0.09	—0.25	—0.50	—0.53	—0.37	—0.08	+0.16
Norske Hav (*Norwegian Sea*)	—0.17	—0.29	—0.22	—0.12	—0.01	+0.15	+0.24	+0.20	+0.12	+0.06	+0.06	0.00
Forskjel (*Difference*)	+0.40	+0.55	+0.54	+0.47	+0.33	—0.06	—0.49	—0.70	—0.65	—0.43	—0.14	+0.16

Mellem Middag og Kl. 10 Aften er der, samtidig, Overskud af Luft over Havet og det skorter paa Luft over Landet, mellem Midnat og Kl. 10 Formiddag er der, samtidig, Overskud af Luft over Landet og det skorter paa Luft over Havet.

Til Oplysning om Lufttrykkets daglige Periode i Sommermaanederne paa Randen af Grønlandshavet tjene følgende Resultater fra den svenske Expedition til Spidsbergen 1872—73 og den tyske Expedition til Østgrønland 1869—70. Efter de af Dr. A. Wijkander i "Observations météorologiques de l'expédition arctique Suédoise 1872—73" Side 98 meddelte timevise Observationsmedia for Juni findes (Mosselbay) følgende observerede Afvigelser fra Middel af Kl. 8, 2 og 8:

+ 0.05 0.00 — 0.06

altsaa et Formiddagsmaximum og et Eftermiddagsminimum.

Ved grafisk Udjevning findes endvidere:

Maximum Kl. 11 a.m. + 0.08^{mm} Minimum Kl. 7 p.m. — 0.11^{mm}
„ Midnat + 0.05 „ „ 6 a.m. — 0.01

Perioden er altsaa den sædvanlige, med noget forsinkede Epoker for Vendetiderne. Amplituden er liden, kun 0.^{mm}19.

Efter de af Capt. K. Koldewey i "Zweite Deutsche Nordfahrt IV, Meteorologie und Hydrographie," Side 604

Between noon and 10 p.m. there is simultaneously a surplus of air above the sea and a comparative lack of air above the land; between midnight and 10 a.m. there is a surplus of air above the land and a comparative lack of air above the sea.

With a view to elucidate the diurnal period of the pressure of the air in the summer months at the borders of the Greenland sea, I will here cite the following results obtained on the Swedish Expedition to Spitzbergen, 1872 and 1873, and on the German Expedition to East Greenland, 1869 and 1870. From the hourly observed means for June (Mossel Bay), communicated by Dr. A. Wijkander in "Observations météorologiques de l'expédition arctique Suédoise, 1872 — 1873," p. 98, are found the following observed deviations from the mean of 8^h, 2^h, and 8^m.

+ 0.05 0.00 — 0.06,

accordingly a maximum in the morning and a minimum in the afternoon.

Furthermore, by drawing a free hand curve I found: —

Maximum 11 a.m. + 0.08^{mm}; Minimum 7 p.m. — 0.11^{mm}.
„ 12 p.m. + 0.05 ; „ 6 a.m. — 0.01.

The period is therefore that commonly found, with somewhat retarded epochal hours. The total range is small, only 0.^{mm}19.

According to the means for every alternate hour during the months of June, July, and August, communicated by

Spidsbergen, østenom Grønlands Østkyst, over Island[1] og vestenom og søndenom Færøerne. Det omfatter de Strøg af Havet, hvor den varme Havstrøm fra Nordatlanterhavet trænger ind paa højere Bredder mellem Norge og Grønland-Spidsbergen og de af denne Havstrøm beskyllede Kyster.[2]

Hvorvidt denne ejendommelige Form for Lufttrykkets daglige Variation tihører det norske Hav og dets Sommermaaneder[3] alene, maa fremtidige Undersøgelser vise. De Egne, hvor man skulde søge den, maatte, ifølge Buchans Karter, være Beringshavet og den nordligste Del af det pacifiske Ocean og muligens et Strøg i den sydlige Del af det indiske og pacifiske Ocean, omkring 50° sydlig Bredde. Den sydlige Grænse for det norske Havs Felt kunde maaske bestemmes ved Observationer fra Skibe der sejle mellem Skotland og Newfoundland.

Til Forklaringen af det Fænomen, som gjennem vor Expeditions Barometermaalinger har vist sig, kan jeg ikke anføre noget bedre, end hvad Professor J. Hann siger i sin Afhandling "Ueber den täglichen Gang des Luftdruckes, etc. auf den Plateaux der Rocky Mountains, aus dem LXXXIII Bande der Sitzb. der k. Akad. der Wissensch. II Abth. März-Heft. Jahrg. 1881," Side 10:

"En lignende Proces — som i Dalene — finder Sted mellem Land og Hav; om Dagen flyder i de øvre Lag Luften over Landet hen mod Havet og bevirker der en

[1] Vestgrønland har samme Periode som Fjordene:

Godthaab:	+ 0.02	— 0.14	+ 0.12
Jacobshavn:	+ 0.12	— 0.17	+ 0.05

[2] Hvorledes Perioden faldt under Expeditionens Rejser i de forskjellige Strøg af Havet, sees af nedenstaaende Tabel.

Tid.	Strøg.	Min.	Max.
1876 Juni 28— Juli 8:	Christiansund til Færøerne	3^h a.m.,	1^h p.m.
„ Juli 17—26;	Færøerne til Island	1 p.m.,	1 a.m.
„ Aug. 4—13;	Island til Namsos	1 a.m.,	1 p.m.
1877 Juni 16— Juli 26;	udenfor Norges Kyst	6 a.m.,	4 p.m.
„ Juli 25— Aug. 9:	Norge — Jan Mayen	5 a.m.,	8 p.m.
1878 Juni 28— Juli 7;	Østhavet	6 a.m.,	4 p.m.
„ Juli 14—24;	Nordkap — Grønlandshavet	6 a.m.,	5 p.m.
„ Juli 30— Aug. 25;	Spidsbergen — Grønlandsh.	6 a.m.,	0 p.m.
		7 p.m.,	12 p.m.

Med Undtagelse af Strøget Færøerne — Island, hvor Expeditionen laa 4 Dage vejrfast ved Vestmannaøerne og idethele var paa større vestlige Længder (udenfor Feltet?), falder Minimum overalt om Morgenen og Maximum om Eftermiddagen. I Havet udenfor Spidsbergens Vestkyst fandtes 2 Maxima og 2 Minima. Disse 2 sidste ere omtrent lige sterkt udprægede, medens Middagsmaximumet er betydelig mere fremtrædende end Midnattens. Det er her at bemerke, at Expeditionen laa til Ankers 1½ Dag ved Norskøerne, 1 Dag i Magdalena Baj og 4 Dage i Advent Baj, hvilke Dages Observationer indgaa i ovenstaaende Resultat.

[3] Medium af December, Januar og Februar:

Skudesnes	— 0.06	— 0.08	+ 0.13
Christiansund	— 0.10	+ 0.03	+ 0.06

Iceland,[1] and west and south of the Færoes. This tract comprises such parts of the Norwegian Sea through which the warm current from the North Atlantic flows into higher latitudes, between Norway and Greenland-Spitzbergen and the coasts washed by the said current.[2]

Whether this peculiar feature attending the daily variation of the pressure of the air, be exclusively characteristic of the Norwegian Sea and the summer months[3] in that region, is a question that future investigations must decide. The regions in which, according to Buchan's chart, it should be sought for, are Bering's Sea and the most northerly part of the Pacific Ocean; possibly, too, a tract in the southern part of the Indian and Pacific Oceans, in about 50° S. lat. The southern boundary of the tract in the Norwegian Sea might, perhaps, be determined by means of observations taken on vessels sailing between Scotland and Newfoundland.

As an explanation of the phenomenon that asserted itself in the barometrical observations taken on the Norwegian Expedition, I can adduce nothing better than the remarks of Professor J. Hann in his Memoir "Ueber den täglichen Gang des Luftdruckes etc., auf den Plateaux der Rocky Mountains, aus dem LXXXIII Bande der Sitzb. der k. Akad. der Wissensch., II Abth., März-Heft., Jahrg. 1881," p. 10: —

"A process similar to that in the valleys goes on between land and sea; in the day time the air in the upper strata above the land flows towards the sea, occasioning an

[1] West Greenland has the same period as the Fjords, viz. —

Godthaab: —	+ 0.02	— 0.14	+ 0.12
Jacobshavn: —	+ 0.12	— 0.17	+ 0.05

[2] The period on the cruises of the Expedition in the different parts of the Norwegian Sea, is seen from the Table given below.

Time.	Tract.
1876 June 28— July 8	Christiansund to the Færoes.
„ July 17—26	Færoes to Iceland.
„ Aug. 4—13	Iceland to Namsos.
1877 June 16— July 26	Off the Coast of Norway.
„ July 25— Aug. 9	Norway — Jan Mayen.
1878 June 28— July 7	The Barents' Sea.
„ July 14—24	North Cape — Greenland Sea.
„ July 30— Aug. 25	Spitzbergen — Greenland Sea.

Saving the tract between the Færoes and Iceland, where the Expedition lay wind-bound for 4 days at the Vestmanna Islands, and was indeed on the whole passage in more westerly longitude (without the district in question?), the minimum occurred everywhere in the morning and the maximum in the afternoon. In the sea off the west coast of Spitzbergen, there were 2 maxima and 2 minima. The two latter have about equal prominence, whereas the noon maximum is much more prominent than the midnight maximum. I must not omit to state, that the Expedition lay a day and a half at anchor at the Norway Islands, one day in Magdalena Bay, and 4 days in Advent Bay, the observations taken on these days being comprised in the result given above.

[3] Mean for December, January, and February: —

Skudesnes: —	— 0.06	— 0.08	+ 0.13
Christiansund: —	— 0.10	+ 0.03	+ 0.06

p. m.

Klokkeslet	1^h	2^h	3^h	4^h	5^h	6^h	7^h	8^h	9^h	10^h	11^h	12^h	Hour.
Corr. Obs.media	11.04	11.07	10.88	10.87	10.77	10.74	10.59	10.47	10.36	10.28	10.27	10.25	Corr. obs. means.
Afv. fra Dagsmedium	0.52	0.55	0.36	0.35	0.25	0.22	0.07	—0.05	—0.16	—0.24	—0.25	—0.27	Diff. from daily mean.
Beregnet Afvigelse	0.49	0.47	0.42	0.35	0.27	0.18	0.07	—0.05	—0.16	—0.23	—0.27	—0.28	Computed difference.
Forskjel: Obs. — Ber.	0.03	0.08	—0.06	0.00	—0.02	0.04	0.00	0.00	0.00	—0.01	0.02	0.01	Diff.: obs. — comp.

Formel (*Formula*): $t_t = 10.^\circ52 - 0.^\circ422 \sin(58^\circ 41.'0 + t) + 0.^\circ085 \sin(61^\circ 43' + 2t)$
$- 0.^\circ023 \sin(153^\circ 46' + 3t) + 0.^\circ014 \sin(58^\circ 24' + 4t)$.

Figuren Pl. I, Luftens Temperatur 1876, viser den observerede og den beregnede Curve. MF $= \pm 0.^\circ023$.

Efter Formelen beregnes:

Minimum: — $0.^\circ37$, $4^h\,2^m$ a.m. Maximum: + $0.^\circ49$, $1^h\,6^m$ p.m.

Medium indtræffer: $8^h\,36^m$ a.m. og $7^h\,39^m$ p.m.

Amplitude: $0.^\circ87$.

Efter de observerede Værdier falder Minimum nærmest 2^h a.m., men indtil 6^h a.m. er Stigningen kun ringe. Observationerne lægge Maximum ved 2^h p.m.

The figure in Pl. I, Temperature of the Air 1876, shows the observed and the computed curve. MF $= \pm 0.^\circ023$.

From the formula is computed —

Minimum — $0.^\circ37$, $4^h\,2^m$ a.m.; Maximum + $0.^\circ49$, $1^h\,6^m$ pm.

The Mean occurs at $8^h\,36^m$ a.m. and $7^h\,39^m$ p.m.

Total Range: $0.^\circ87$.

According to the observed values, the minimum occurs nearest 2 a.m.; but up to 6 a.m. the rise is but slight. The observations place the maximum at 2 p.m.

1877.

Følgende hele Observationsdage ere anvendte til den første Gruppe, der omfatter den varme Havstrøm udenfor Norges Kyst.

Juni 16 til Juni 22, 7 Dage. Rejsen udenfor Helgelands Kyst.
Juni 29 „ Juni 30, 2 „ „ „ Lofoten.
Juli 3 „ Juli 7, 5 „ „ fra Sortland til Tromsø.
Juli 16 „ Juli 19, 4 „ „ nordenfor Tromsø.
Juli 25 „ Juli 26, 2 „ „ til Jan Mayen.

Ialt 20 Dage, mellem Bredderne 66° og 71°.

1877.

The following whole observation days were devoted to the first group, which refers to the warm ocean current off the coast of Norway.

June 16 to June 22, 7 days: on the cruise off the coast of Helgeland.
June 29 „ June 30, 2 „ „ „ „ „ Lofoten.
July 3 „ July 7, 5 „ „ „ passage from Sortland to Tromsø.
July 16 „ July 19, 4 „ „ „ cruise north of Tromsø.
July 25 „ July 26, 2 „ „ „ passage to Jan Mayen.

Total, 20 days, between 66° and 71° N. lat.

Den (*on the*) 16 Juni (*of June*), 1^h a.m., var Temperaturen (*the temperature was*) $7.^\circ0$.
„ „ 23 „ „ „ „ „ $6.^\circ5$.
Forskjel (*Difference*) $0.^\circ5 : 7 = 0.^\circ07 = c$.

Den (*on the*) 28 Juni (*of June*), 12^h p.m., var Temperaturen (*the temperature was*) $6.^\circ7$.
„ „ 30 „ „ „ „ „ $8.^\circ2$.
Forskjel (*Difference*) $-1.^\circ5 : 2 = -0.^\circ75 = c$.

Den (*on the*) 3 Juli (*of July*), 1^h a.m. var Temperaturen (*the temperature was*) $9.^\circ0$.
„ „ 8 „ „ „ „ „ $7.^\circ2$.
Forskjel (*Difference*) $1.^\circ8 : 5 = 0.^\circ36 = c$.

Den (*on the*) 16 Juli (*of July*), 1^h a.m. var Temperaturen (*the temperature was*) $9.^\circ0$.
„ „ 20 „ „ „ „ „ $7.^\circ2$.
Forskjel (*Difference*) $1.^\circ8 : 4 = 0.^\circ45 = c$.

Den (*on the*) 25 Juli (*of July*), 1^h p.m. var Temperaturen (*the temperature was*) $7.^\circ2$.
„ „ 27 „ „ „ „ „ $8.^\circ2$.
Forskjel (*Difference*) $-1.^\circ0 : 2 = -0.^\circ50 = c$.

Fejlen i Observationsklokkeslettet ved Middag er størst, — 20.^{m}5, den 28de Juli og næststørst, — 9.^{m}1 den 4de August. Summen af positive Fejl er 2.^{m}1, fordelt paa 3 Dage eller 0.^{m}7 pr. Dag. Summen af negative Fejl er — 37.^{m}6, fordelt paa 4 Dage, eller — 9.^{m}4 pr. Dag. Den gjennemsnitlige Fejl bliver — 35.^{m}5, fordelt paa 9 Dage (2 Dage til Ankers under Jan Mayen) eller — 3.^{m}9 pr. Dag.

The error in the hour of observation at noon had its greatest value, — 20.^{m}5, July 28th, and its next greatest, — 9.^{m}1, August 4th. The sum of the positive errors is 2.^{m}1, distributed over 3 days, or 0.^{m}7 per day. The sum of the negative errors is — 37.^{m}6, distributed over 4 days, or — 9.^{m}4 per day. The average error is thus — 35.^{m}5, distributed over 9 days (2 days at anchor off the coast of Jan Mayen), or — 3.^{m}9 per day.

a. m.

Klokkeslet	1^h	2^h	3^h	4^h	5^h	6^h	7^h	8^h	9^h	10^h	11^h	12^h	Hour.
Corr. Obs.media	2.37	2.43	2.23	2.30	2.47	2.69	2.89	3.18	3.31	3.55	3.62	3.83	Corr. obs. means.
Afv. fra Dagsmedium	—0.73	—0.67	—0.87	—0.80	—0.63	—0.41	—0.21	0.08	0.21	0.45	0.52	0.73	Diff. from daily mean.
Beregnet Afvigelse	—0.73	—0.78	—0.80	—0.76	—0.64	—0.44	—0.19	0.05	0.26	0.42	0.55	0.68	Computed difference.
Forskjel: Obs. — Ber.	0.00	0.11	—0.07	—0.04	0.01	0.03	—0.02	0.03	—0.05	0.03	—0.03	0.05	Diff.: obs. — comp.

p. m.

Corr. Obs.media	3.92	3.96	4.00	3.93	3.89	3.36	3.13	3.03	2.78	2.60	2.53	2.37	Corr. obs. means.
Afv. fra Dagsmedium	0.82	0.86	0.90	0.83	0.79	0.26	0.03	—0.07	—0.32	—0.50	—0.57	—0.73	Diff. from daily mean.
Beregnet Afvigelse	0.81	0.91	0.93	0.84	0.64	0.37	0.10	—0.15	—0.34	—0.48	—0.58	—0.66	Computed difference.
Forskjel: Obs. — Ber.	0.01	—0.05	—0.03	—0.01	0.15	—0.11	—0.07	0.08	0.02	—0.02	0.01	—0.07	Diff.: obs. — comp.

Formel (*Formula*). $t_t = 3.^010 - 0.^0850 \sin(61^0\,41.'3 + t) + 0.^0055 \sin(22^0\,37' + 2t)$
$+ 0.^0076 \sin(86^0\,10' + 3t) - 0.^0013 \sin(96^0\,23' + 4t)$

Figuren Pl. I, Luftens Temperatur 1877 B, Polar-Strømmen, viser, at den beregnede Curve slutter sig godt til den observerede. MF = ± 0.^{0}046.

Efter Formelen beregnes:

Minimum: —0.^{0}81, $2^h\,53^m$ a.m., Maximum: + 0.^{0}93, $2^h\,42^m$ p.m.

Medium indtræffer $7^h\,46^m$ a.m. og $7^h\,22^m$ p.m.

Amplitude: 1.^{0}74.

Den forholdsvis store Amplitude, som saaledes er fundet i Polarstrømmens Strøg, synes hovedsagelig at hidrøre fra den senere Aarstid, i hvilken Observationerne her ere tagne. De faa Dage af August, som Expeditionen brugte paa Tilbagereisen til Norge, nemlig den 6te til 10de August, udvise en endnu større Amplitude end den ved Jan Mayen fundne. Observationerne fra disse faa Dage, af hvilke der kun vilde være 4 hele Døgn til Disposition for Beregning af den daglige Periode, har jeg ikke villet slaa sammen med de tidligere udenfor Norges Kyst tagne, da de repræsentere en temmelig forskjellig Aarstid. Til en selvstændig Beregning er Dagenes Antal forekommet mig for ringe.

The figure in Pl. I, Temperature of the Air, 1877 B, Polar Current, shows that the computed curve agrees well with that observed. MF = ± 0.^{0}046.

From the formula is computed —

Minimum — 0.^{0}81, $2^h\,53^m$ a.m.; Maximum + 0.^{0}93, $2^h\,42^m$ p.m.

The Mean occurs at $7^h\,46^m$ a.m. and $7^h\,22^m$ p.m.

Total Range: 1.^{0}74.

The comparatively extensive range thus found from the observations taken within the limits of the Polar current, would appear to be chiefly a result of the late season of the year. The few days in August passed on the return of the Expedition to Norway, viz. from the 6th to the 10th of that month, exhibit a still greater oscillation than that found from the observations off Jan Mayen. The observations made on this limited number of days, of which only 4 whole ones could be devoted to computing the diurnal period, I have not seen fit to group along with those previously taken off the Norwegian coast, representing as they do a comparatively different season of the year. To form a separate group, I have deemed the number of days too small.

1878.

Den første Gruppe omfatter Expeditionens 2 første Ture, fra Slutningen af Juni til henimod Slutningen af

1878.

The first group comprises the observations taken on the 2 first cruises of the Expedition, from the end of June

Efter de observerede Værdier falder Minimum ved Midnat og Maximum ved Kl. 3 p.m.

According to the observed values, the minimum occurs at midnight and the maximum at 3 p.m.

Observationerne fra Expeditionens sidste Tur i 1878, til Beeren-Eiland, Spidsbergen og Grønlandsisen, give, naar de sammenstilles, en daglig Periode med et Maximum ved Middag, et Minimum Kl. 6 Efterm., et mindre Maximum ved Midnat og et mindre Minimum Kl. 5 Morgen. Disse Observationer ere saaledes aabenbart uskikkede til deraf at udlede Temperaturens daglige Periode. Et Blik paa Kartet viser, at Expeditionen paa den sidste Tur hyppigt flyttede Plads fra den varme Strøm til Polarstrømmene (Grønlandshavets og Beeren-Eilands) og deri turde Aarsagen til Temperaturens, fra det sædvanlige afvigende, gjennemsnitlige daglige Gang være at søge.

The observations taken on the last voyage of the Expedition, in 1878, to Beeren Eiland, Spitzbergen, and the Greenland ice, give, when collated, a diurnal period with a maximum at noon, a minimum at 6 p.m., a smaller maximum at midnight, and a smaller minimum at 5 a.m. These observations are therefore manifestly not adapted for educing the diurnal period of the temperature. A glance at the Map will show that the position of the vessel on her last cruise was frequently changed from the warm to the Polar currents (that setting through the Greenland Sea and that flowing past Beeren Eiland), and to this circumstance may probably be ascribed the deviation of the diurnal variation of the temperature from that usually found.

Fra den 19de til 22de August 1878 var Expeditionen i Isfjorden paa Spidsbergen, og laa fra Kl. 4 p.m. den 19de til Kl. 6 p.m. den 22de til Ankers i *Advent Bay*. For disse 4 Dage er Temperaturens daglige Periode beregnet.

Den 18de August 12ʰ p.m. var Temperaturen 2.°4.
„ 22de „ „ „ 2.°4.
Altsaa $c = 0$.

From the 19th to the 22nd of August 1878, the Expedition was in Ice Sound, Spitzbergen, and lay at anchor, from 4 p.m. on the 19th to 6 p.m. on the 22nd, in *Advent Bay*. For these 4 days the diurnal period of the temperature was computed.

On the 18th of Aug., 12 p.m., the temperature was 2.°4.
„ 22nd „ „ „ 2.°4.
Hence, $c = 0$.

a. m.

Klokkeslet	1ʰ	2ʰ	3ʰ	4ʰ	5ʰ	6ʰ	7ʰ	8ʰ	9ʰ	10ʰ	11ʰ	12ʰ	Hour.
Corr. Obs.media	2.05	2.05	2.15	2.23	2.33	2.45	2.85	2.93	3.25	3.25	3.23	3.33	Corr. obs. means.
Afv. fra Dagsmedium	—0.65	—0.65	—0.55	—0.47	—0.37	—0.25	0.15	0.23	0.55	0.55	0.53	0.63	Diff. from daily mean.
Beregnet Afvigelse	—0.61	—0.64	—0.59	—0.49	—0.34	—0.16	0.07	0.27	0.44	0.55	0.61	0.61	Computed difference.
Forskjel: Obs.—Ber.	- 0.04	—0.01	0.04	0.02	—0.03	—0.09	0.08	—0.04	0.11	0.00	—0.08	0.02	Diff.: obs. — comp.

p. m.

Corr. Obs.media	3.25	3.15	3.13	2.98	2.88	2.78	2.68	2.70	2.40	2.35	2.28	2.23	Corr. obs. means.
Afv. fra Dagsmedium	0.55	0.45	0.43	0.28	0.18	0.08	—0.02	0.00	—0.30	—0.35	—0.42	—0.47	Diff. from daily mean.
Beregnet Afvigelse	0.54	0.47	0.38	0.28	0.18	0.09	—0.01	—0.10	—0.21	—0.32	—0.44	—0.54	Computed difference.
Forskjel: Obs. — Ber.	0.01	—0.02	0.05	0.00	0.00	—0.01	—0.01	0.10	—0.09	—0.03	0.02	0.07	Diff.: obs. — comp.

Formel (*Formula*): $t_t = 2.^\circ 70 - 0.^\circ 585 \sin(78^\circ 27.'5 + t) + 0.^\circ 116 \sin(164^\circ 32' + 2t)$.

Figuren Pl. II, Vanddampenes Tryk 1876, viser den observerede og den beregnede Curve. MF $= \pm\ 0.^{mm}019$.

Efter Formelen beregnes:

Minimum: $-\ 0.^{mm}11$, $3^h\ 50^m$ a.m.
„ $-\ 0.^{mm}09$, $10^h\ 14^m$ p.m.
„ $+\ 0.^{mm}10$, $1^h\ 50^m$ p.m.

Medium indtræffer: $8^h\ 18^m$ a.m. og $7^h\ 35^m$ p.m.

Amplitude: $0.^{mm}24$.

Den beregnede Curve ligner Curven for den daglige Variation af Vanddampenes Tryk paa Indlandsstationer med sit secundære Minimum om Eftermiddagen. Dette Minimum er ikke fremkommet ved nogen større Vindhastighed, der paa den Tid af Dagen skulde have gjort det psychrometrisk bestemte Tryk af Vanddampene mindre, thi, som Curven for Vindhastigheden i 1876, Pl. III, viser, har denne ogsaa et secundært Minimum omkring Kl. 2 Eftm.

The figure in Pl. II, Force of Vapour, 1876, shows the observed and the computed curve. MF $= \pm\ 0.^{mm}019$.

From the formula were computed —

Maximum: $+\ 0.^{mm}13$, $4^h\ 32^m$ p.m.
„ $+\ 0.^{mm}11$, $11^h\ 39^m$ a.m.
„ $-\ 0.^{mm}08$, $0^h\ 2^m$ a.m.

The Mean occurs at $8^h\ 18^m$ a.m. and $7^h\ 35^m$ p.m.

Total Range: $0.^{mm}24$.

The computed curve resembles the curve for the diurnal variation of the force of vapour at inland stations, with a secondary minimum in the afternoon. This minimum is not the result of any increase in the velocity of the wind, which, at that time of the day, should have reduced the psychrometrically determined force of the vapour; for, as shown by the curve for the wind-velocity in 1876, Pl. III, this velocity, too, has a secondary minimum about 2 p.m.

1877.

Den første Gruppe omfatter 19 Observationsdage i den varme Strøm. Dagene ere de samme som de, der ere benyttede til Luftens Temperatur, med Undtagelse af den 21de Juni, der ikke er medtaget her, fordi det vaade Thermometer i flere Timer ikke havde været tilstrækkeligt vaadt.

The first group comprises 19 observation days in the warm current. The days were the same as those devoted to determining the temperature of the air, with the exception of the 21st of June, which is not included here, since the wet bulb during several hours on that day had not been sufficiently supplied with water.

Den (*on the*) 16 Juni (*of June*) 1^h a.m., var Vanddampenes Tryk (*the force of vapour was*) $7.^{mm}4$.
„ „ 21 „ „ „ „ $5.^{mm}3$.
Forskjel (*Difference*) $2.^{mm}1 : 5 = 0.^{mm}42 = c$.

Den (*on the*) 22 Juni (*of June*) 1^h a.m., var Vanddampenes Tryk (*the force of vapour was*) $5.^{mm}4$.
„ „ 23 „ „ „ „ $5.^{mm}7$.
Forskjel (*Difference*) $-\ 0.^{mm}3 : 1 = -\ 0.^{mm}30 = c$.

Den (*on the*) 28 Juni (*of June*) 12^h p.m., var Vanddampenes Tryk (*the force of vapour was*) $4.^{mm}9$.
„ „ 30 „ „ „ „ $7.^{mm}2$.
Forskjel (*Difference*) $-\ 2.^{mm}3 : 2 = -\ 1.^{mm}15 = c$.

Den (*on the*) 3 Juli (*of July*) 1^h a.m., var Vanddampenes Tryk (*the force of vapour was*) $7.^{mm}6$.
„ „ 8 „ „ „ „ $6.^{mm}2$.
Forskjel (*Difference*) $1.^{mm}4 : 5 = 0.^{mm}28 = c$.

Den (*on the*) 16 Juli (*of July*) 1^h a.m., var Vanddampenes Tryk (*the force of vapour was*) $8.^{mm}1$.
„ „ 20 „ „ „ „ $6.^{mm}7$.
Forskjel (*Difference*) $1.^{mm}4 : 4 = 0.^{mm}35 = c$.

Den (*on the*) 25 Juli (*of July*) 1^h a.m., var Vanddampenes Tryk (*the force of vapour was*) $6.^{mm}7$.
„ „ 27 „ „ „ „ $7.^{mm}9$.
Forskjel (*Difference*) $-\ 1.^{mm}2 : 2 = -\ 0.^{mm}60 = c$.

For den hele Gruppe bliver $c = +\ 0.^{mm}058$.

Den gjennemsnitlige Fejl i Observationsklokkeslettet ved Middag bliver $-\ 2.^m3$.

For the whole group $c = +\ 0.^{mm}058$.

The average error in the hour of observation at noon is $-\ 2.^m3$.

Formel (*Formula*): $e_t = 5.^{mm}33 - 0.^{mm}192 \sin(82^0\ 3.'7 + t) + 0.^{mm}014 \sin(38^0\ 9' + 2t)$.

Figuren Pl. II, Vanddampenes Tryk 1877 B, Polar-Strømmen, viser den observerede og den beregnede Curve. MF $= \pm\ 0.^{mm}032$.

Af Formelen beregnes:

Minimum: $-\ 0.^{mm}18$, $0^h\ 6^m$ a.m.

Maximum: $+\ 0.^{mm}21$, $0^h\ 47^m$ p.m.

Medium indtræffer: $6^h\ 47^m$ a.m. og $6^h\ 20^m$ p.m.

Amplitude: $0.^{mm}39$.

Den større Amplitude i Polarstrømmen følger den større Amplitude af Temperaturen.

The figure in Pl. II, Force of Vapour, 1877 B. Polar Current, shows the observed and the computed curve. MF $= \pm\ 0.^{mm}032$.

From the formula is computed —

Minimum $-\ 0.^{mm}18$, $0^h\ 6^m$ a.m.

Maximum $+\ 0.^{mm}21$, $0^h\ 47^m$ p.m.

The Mean occurs at $6^h\ 47^m$ a.m. and $6^h\ 20^m$ p.m.

Total Range: $0.^{mm}39$.

The greater range in the Polar current corresponds with the greater range of the temperature.

1878.

Den første Gruppe omfatter de samme 21 Observationsdage, som ere benyttede til Beregningen af Perioden for Luftens Temperatur.

1878.

The first group comprises the same observation days, 21, as were devoted to computing the diurnal period of the temperature of the air.

Den (*on the*) 28 Juni (*of June*) 1^h a.m., var Vanddampenes Tryk (*the force of vapour was*) $6.^{mm}6$.
" " 8 Juli (*of July*) " " " $6.^{mm}3$.

Forskjel (*Difference*) $0.^{mm}3 : 10 = 0.^{mm}03 = c$.

Den (*on the*) 13 Juli (*of July*) 12^h p.m., var Vanddampenes Tryk (*the force of vapour was*) $7.^{mm}4$.
" " 24 " " " " $5.^{mm}8$.

Forskjel (*Difference*) $1.^{mm}6 : 11 = 0.^{mm}145 = c$.

For den hele Gruppe bliver $c = +\ 0.^{mm}090$.

For the whole group $c = +\ 0.^{mm}090$.

a. m.

Klokkeslet	1^h	2^h	3^h	4^h	5^h	6^h	7^h	8^h	9^h	10^h	11^h	12^h	Hour.
Corr. Obs.media	5.56	5.48	5.59	5.50	5.48	5.50	5.56	5.53	5.54	5.56	5.52	5.57	Diff. obs. means.
Afv. fra Dagsmedium	0.02	—0.06	0.05	—0.04	—0.06	—0.04	0.02	—0.01	0.00	0.02	—0.02	0.03	Diff. from daily mean.
Beregnet Afvigelse	—0.03	—0.02	—0.02	—0.02	—0.01	—0.01	—0.01	—0.01	—0.01	0.00	0.01	0.02	Computed difference.
Forskjel: Obs. — Ber.	0.05	—0.04	0.07	—0.02	—0.05	—0.03	0.03	0.00	0.01	0.02	—0.03	0.01	Diff.: obs. — comp.

p. m.

Corr. Obs.media	5.56	5.57	5.56	5.61	5.58	5.65	5.57	5.47	5.50	5.57	5.52	5.47	Diff. obs. means.
Afv. fra Dagsmedium	0.02	0.03	0.02	0.07	0.04	0.11	0.03	—0.07	—0.04	0.03	—0.02	—0.07	Diff. from daily mean.
Beregnet Afvigelse	0.03	0.04	0.05	0.05	0.05	0.04	0.02	0.01	—0.01	—0.02	—0.03	—0.03	Computed difference.
Forskjel: Obs.—Ber.	—0.01	—0.01	—0.03	0.02	—0.01	0.07	0.01	—0.08	—0.03	0.05	0.01	—0.04	Diff.: obs. — comp.

Formel (*Formula*): $e_t = 5.^{mm}54 - 0.^{mm}035 \sin(43^0\ 49.'8 + t) - 0.^{mm}014 \sin(146^0\ 19' + 2t)$.

Figuren Pl. II, Vanddampenes Tryk 1878 A, viser den observerede og den beregnede Curve. MF $= \pm\ 0.^{mm}030$.

Af Formelen beregnes:

Minimum: $-\ 0.^{mm}03$, $0^h\ 4^m$ a.m.

Maximum: $+\ 0.^{mm}05$, $3^h\ 45^m$ p.m.

Medium indtræffer: $10^h\ 31^m$ a.m. og $8^h\ 15^m$ p.m.

Amplitude: $0.^{mm}08$.

The figure in Pl. II, Force of Vapour, 1878 A, shows the observed and the computed curve. MF $= \pm\ 0.^{mm}030$.

From the formula is computed —

Minimum $-\ 0.^{mm}03$, $0^h\ 4^m$ a.m.

Maximum $+\ 0.^{mm}05$, $3^h\ 45^m$ p.m.

The Mean occurs at $10^h\ 31^m$ a.m. and $8^h\ 15^m$ p.m.

Total Range: $0.^{mm}08$.

Figuren Pl. II, Relativ Fugtighed 1876, viser den observerede og den beregnede Curve. MF = ± 0.22 %.

Af Formelen beregnes:

Maximum: + 1.0, 5^h 0^m a.m.
Minimum: — 1.8, 1^h 15^m p.m.

Medium indtræffer: 9^h 0^m a.m. og 7^h 0^m pm.
Amplitude 2.8 %.
Den observerede Curve har Minimum ved Kl. 2 p.m.

The figure in Pl. II, Relative Humidity, 1876, shows the observed and the computed curve. MF = ± 0.22 per cent.

From the formula were computed —

Maximum + 1.0, 5^h 0^m a.m.
Minimum — 1.8, 1^h 15^m p.m.

The Mean occurs at 9^h 0^m a.m. and 7^h 0^m p.m.
Total Range: 2.8 per cent.
The observed curve gives the minimum at 2 p.m.

1877.

Gruppe A, 19 Dage.

1877.

Group A, 19 days.

Den (*on the*) 16 Juni (*of June*) 1^h a.m., var den relative Fugtighed (*the relative humidity was*) 99.
" " 21 " " " " " 78.
Forskjel (*Difference*) 21 : 5 = 4.2 = *c*.

Den (*on the*) 22 Juni (*of June*) 1^h a.m., var den relative Fugtighed (*the relative humidity was*) 80.
" " 23 " " " " " 80.
Forskjel (*Difference*) 0 : 1 = 0.0 = *c*.

Den (*on the*) 28 Juni (*of June*) 12^h p.m., var den relative Fugtighed (*the relative humidity was*) 67.
" " 30 " " " " " 89.
Forskjel (*Difference*) — 22 : 2 = — 11.0 = *c*.

Den (*on the*) 3 Juli (*of July*) 1^h a.m., var den relative Fugtighed (*the relative humidity was*) 89.
" " 8 " " " " " 82.
Forskjel (*Difference*) 7 : 5 = 1.4 = *c*.

Den (*on the*) 16 Juli (*of July*) 1^h a.m., var den relative Fugtighed (*the relative humidity was*) 95.
" " 20 " " " " " 89.
Forskjel (*Difference*) 6 : 4 = 1.5 = *c*.

Den (*on the*) 25 Juli (*of July*) 1^h a.m., var den relative Fugtighed (*the relative humidity was*) 89.
" " 27 " " " " " 98.
Forskjel (*Difference*) — 9 : 2 = — 4.5 = *c*.

For den hele Gruppe bliver *c* = + 0.16.

For the whole group, *c* = + 0.16.

a. m.

Klokkeslet	1^h	2^h	3^h	4^h	5^h	6^h	7^h	8^h	9^h	10^h	11^h	12^h	Hour.
Corr. Obs.media	86.4	85.4	86.5	85.6	86.3	85.4	85.5	85.3	86.8	83.8	83.9	84.6	Corr. obs. means.
Afv. fra Dagsmedium	1.4	0.4	1.5	0.6	1.3	0.4	0.5	0.3	1.8	—1.2	—1.1	—0.4	Diff. from daily mean.
Beregnet Afvigelse	0.8	0.9	1.0	1.0	0.9	0.8	0.6	0.4	0.1	—0.2	—0.4	—0.7	Computed difference.
Forskjel: Obs. — Ber.	0.6	—0.5	0.5	—0.4	0.4	—0.4	—0.1	—0.1	1.7	—1.0	—0.7	0.3	Diff.: obs. — comp.

p. m.

Corr. Obs.media	84.0	83.9	85.4	84.2	82.5	84.4	85.0	84.8	85.5	85.3	84.4	86.1	Corr. obs. means.
Afv. fra Dagsmedium	—1.0	—1.1	0.4	—0.8	—2.5	—0.6	0.0	—0.2	0.5	0.3	—0.6	1.1	Diff. from daily mean.
Beregnet Afvigelse	—0.8	—0.9	—1.0	—0.9	—0.8	—0.7	—0.5	—0.2	0.0	0.2	0.5	0.7	Computed difference.
Forskjel: Obs. — Ber.	—0.2	—0.2	1.4	0.1	—1.7	0.1	0.5	0.0	0.5	0.1	—1.1	0.4	Diff.: obs. — comp.

Den (*on the*) 28 Juni (*of June*) 1^h a.m., var den relative Fugtighed (*the relative humidity was*) 86.
„ „ 8 Juli (*of July*) „ „ „ 91.

Forskjel (*Difference*) — 5 : 10 = — 0.50 = *c*.

Den (*on the*) 13 Juli (*of July*) 12^h p.m., var den relative Fugtighed (*the relative humidity was*) 99.
„ „ 24 „ „ „ „ „ 85.

Forskjel (*Difference*) 14 : 11 = 1.27 = *c*.

For den hele Gruppe bliver $c = + 0.43$.

For the whole group $c = + 0.43$.

a. m.

Klokkeslet	1^h	2^h	3^h	4^h	5^h	6^h	7^h	8^h	9^h	10^h	11^h	12^h	Hour.
Corr. Obs.media	90.9	89.7	90.3	89.9	89.6	89.5	89.6	88.8	87.6	87.6	86.2	86.8	Corr. obs. means.
Afv. fra Dagsmedium	2.3	1.1	1.7	1.3	1.0	0.9	1.0	0.2	—1.0	—1.0	—2.4	—1.8	Diff. from daily mean.
Beregnet Afvigelse	1.6	1.5	1.4	1.2	1.0	0.8	0.5	0.0	—0.5	—1.1	—1.7	—2.1	Computed difference.
Forskjel: Obs. — Ber.	0.7	—0.4	0.3	0.1	0.0	0.1	0.5	0.2	—0.5	0.1	—0.7	0.3	Diff.: obs. — comp.

p. m.

Corr. Obs.media	86.0	86.0	85.5	86.7	87.2	90.3	89.1	88.8	89.8	90.2	90.4	89.5	Corr. obs. means.
Afv. fra Dagsmedium	—2.6	—2.6	—3.1	—1.9	—1.4	1.7	0.5	0.2	1.2	1.6	1.8	0.9	Diff. from daily mean.
Beregnet Afvigelse	—2.4	—2.4	—2.2	—1.8	—1.1	—0.4	0.3	0.9	1.3	1.6	1.7	1.7	Computed difference.
Forskjel: Obs. — Ber.	—0.2	—0.2	—0.9	—0.1	—0.3	2.1	0.2	—0.7	—0.1	0.0	0.1	—0.8	Diff.: obs. — comp.

Formel (*Formula*) $r_t = 88.6 + 2.01 \sin (72^0\ 17.'2 + t) - 0.47 \sin (25^0\ 32' + 2t)$.

Figuren Pl. II, Relativ Fugtighed 1878 A, viser den observerede og den beregnede Curve. MF = ± 0.40 %.

Af Formelen beregnes:
Maximum: + 1.7, $11^h\ 20^m$ p.m.
Minimum: — 2.4, $1^h\ 39^m$ p.m.
Medium indtræffer: $8^h\ 0^m$ a.m. og $6^h\ 35^m$ p.m.
Amplitude: 4.1 %.

The figure in Pl. II, Relative Humidity, 1878 A, shows the observed and the computed curve. MF = ± 0.40 per cent.

From the Formula were computed —
Maximum + 1.7, $11^h\ 20^m$ p.m.
Minimum — 2.4, $1^h\ 39^m$ p.m.
The Mean occurs at $8^h\ 0^m$ a.m. and $6^h\ 35^m$ p.m.
Total Range: 4.1 per cent.

Den anden Gruppe, der omfatter Expeditionens sidste Tur, giver en regelmæssig daglig Variation, som Figuren Pl. II, Relativ Fugtighed 1878 B, viser, men denne Curve har ingen reel Betydning, da, som ovenfor vist, den tilsvarende Gang af Lufttemperaturen er uforenelig med den rigtige Gang. Resultatet af Beregningerne vil jeg derfor ikke medtage her.

The other group, comprising the observations taken on the last cruise of the Expedition, gives a regular diurnal period, as seen from the figure in Pl. II, Relative Humidity, 1878 B; but this curve has no real significance, since, as shown above, the corresponding march of the temperature of the air is incompatible with the daily variation. The result of the computations I shall not therefore include here.

1877.

Gruppe A. 20 Dage. de samme som ere benyttede til Lufttrykket og Luftens Temperatur. Den varme Strøm langs Norges Kyst.

1877.

Group A, 20 days, the same that were devoted to determining the pressure and the temperature of the air. The warm current flowing along the coast of Norway.

Den (*on the*) 16 Juni (*of June*) 1^h a.m., var Vindens Hastighed (*the velocity of the wind was*) 6.8.
" " 23 " " " " " 6.7.
Forskjel (*Difference*) 0.1 : 7 = 0.01 = *c*.

Den (*on the*) 28 Juni (*of June*) 12^h p.m., var Vindens Hastighed (*the velocity of the wind was*) 4.3.
" " 30 " " " " " 3.0.
Forskjel (*Difference*) 1.3 : 2 = 0.65 = *c*.

Den (*on the*) 3 Juli (*of July*) 1^h a.m., var Vindens Hastighed (*the velocity of the wind was*) 5.0.
" " 8 " " " " " 5.6.
Forskjel (*Difference*) — 0.6 : 5 = — 0.12 = *c*.

Den (*on the*) 16 Juli (*of July*) 1^h a.m., var Vindens Hastighed (*the velocity of the wind was*) 0.0.
" " 27 " " " " " 15.0.
Forskjel (*Difference*) — 15.0 : 4 = — 3.75 = *c*.

Den (*on the*) 25 Juli (*of July*) 1^h a.m., var Vindens Hastighed (*the velocity of the wind was*) 12.6.
" " 27 " " " " " 3.6.
Forskjel (*Difference*) 9.0 : 2 = 4.50 = *c*.

For den hele Gruppe bliver *c* = — 0.26.

For the whole group *c* = — 0.26.

a. m.

Klokkeslet	1^h	2^h	3^h	4^h	5^h	6^h	7^h	8^h	9^h	10^h	11^h	12^h	Hour.
Corr. Obs.media	7.26	7.28	7.35	6.71	6.68	6.60	6.68	7.06	7.11	6.82	7.68	8.19	Corr. obs. means.
Afv. fra Dagsmedium	0.02	0.04	0.11	—0.53	—0.56	—0.64	—0.56	—0.18	—0.13	—0.42	0.44	0.95	Diff. from daily mean.
Beregnet Afvigelse	0.17	0.05	—0.13	—0.32	—0.49	—0.58	—0.56	—0.43	—0.21	0.04	0.28	0.46	Computed difference.
Forskjel: Obs.—Ber.	—0.15	—0.01	0.24	—0.21	—0.07	—0.06	0.00	0.25	0.08	—0.46	0.16	0.49	Diff.: obs. — comp.

p. m.

Corr. Obs.media	7.30	7.87	7.35	7.57	7.51	7.19	7.01	7.01	7.26	7.24	7.11	7.92	Corr. obs. means.
Afv. fra Dagsmedium	0.06	0.63	0.11	0.33	0.27	—0.05	—0.23	—0.23	0.02	0.00	—0.13	0.68	Diff. from daily mean.
Beregnet Afvigelse	0.54	0.51	0.39	0.22	0.04	—0.09	—0.16	—0.14	—0.05	0.07	0.17	0.21	Computed difference.
Forskjel: Obs.—Ber.	—0.48	0.12	—0.28	0.11	0.23	0.04	—0.07	—0.09	0.07	—0.07	—0.30	+0.47	Diff.: obs. — comp.

Formel (*Formula*): $W_t = 7.^m24 - 0.^m271 \sin(27^0\,24.'4 + t) + 0.^m361 \sin(68^0\,26' + 2t)$.

Figuren Pl. III. Vindens Hastighed 1877 A, viser den observerede og den beregnede Curve. MF = ± 0.^{m}19.
Af Formelen beregnes:

Maximum: + 0.54, 1^h 14^m p.m.;
" + 0.21, 0^h 5^m a.m.;

Medium indtræffer: 2^h 21^m a.m., 9^h 52^m a.m., 5^h 19^m p.m. og 9^h 25^m p.m.
Amplitude: 1.^{m}12.

The figure in Pl. III. Velocity of the Wind, 1877 A, shows the observed and the computed curve. MF = ± 0.^{m}19.
From the formula were computed —

Minimum: — 0.58, 6^h 20^m a.m.
" — 0.16, 7^h 15^m p.m.

The Mean occurs at 2^h 21^m a.m., at 9^h 52^m a.m., at 5^h 19^m p.m., and at 9^h 25^m p.m.
Total Range: 1.^{m}12.

Den (*on the*) 30 Juli (*of July*) 1^h a.m., var Vindhastigheden (*the velocity of the wind was*) 4.7.
„ „ 15 Aug. (*of Aug.*) „ „ „ 5.6.
Forskjel (*Difference*) — 0.9. : 16 = — 0.06 = *c*.

For den hele Gruppe bliver $c = -$ 0.^{m}25.

For the whole group $c = -$ 0.^{m}25.

Fejlen i Observationsklokkeslettet ved Middag er størst, — 33.^{m}0, den 8de August, paa Vejen fra Sydkap vestover. Den har sin næststørste Værdi, + 24.^{m}8, den 12te August. Summen af positive Fejl er + 194.^{m}4, fordelt paa 14 Dage, eller + 13.^{m}8 pr. Dag. Summen af negative Fejl er —318.^{m}3, fordelt paa 22 (1 Dag under Beeren-Eiland) Dage, eller — 14.^{m}5 pr. Dag. Den gjennemsnitlige Fejl bliver — 123.^{m}9, fordelt paa 37 Dage, eller — 3.^{m}35 pr. Dag.

The error in the hour of observation at noon was greatest, — 33.^{m}0, August 8th, on the passage west from Cape South. Its next greatest value, + 24.^{m}8, occurred August 12th. The sum of the positive errors is + 194.^{m}4, distributed over 14 days, or + 13.^{m}8 per day. The sum of the negative errors is — 318.^{m}3, distributed over 22 days (1 day off Beeren Eiland), or — 14.^{m}5 per day. The average error is accordingly — 123.^{m}9, distributed over 37 days, or — 3.^{m}35 per day.

a. m.

Klokkeslet	1^h	2^h	3^h	4^h	5^h	6^h	7^h	8^h	9^h	10^h	11^h	12^h	Hour.
Corr. Obs.media	8.08	7.90	7.93	8.05	8.16	7.86	8.22	8.04	8.01	7.72	7.76	7.83	Corr. obs. means.
Afv. fra Dagsmedium	0.06	—0.12	—0.09	0.03	0.14	—0.16	0.20	0.02	—0.01	—0.30	—0.26	—0.19	Diff. from daily mean.
Beregnet Afvigelse	0.04	0.04	0.04	0.04	0.03	0.00	—0.03	—0.07	—0.10	—0.13	—0.14	—0.14	Computed difference.
Forskjel: Obs. — Ber.	0.02	—0.16	—0.13	—0.01	0.11	—0.16	0.23	0.09	0.09	—0.17	—0.12	—0.05	Diff.: obs. — comp.

p. m.

Corr. Obs.media	7.76	8.03	8.35	8.06	8.16	7.80	8.04	8.09	8.11	8.22	8.25	8.09	Corr. obs. means.
Afv. fra Dagsmedium	—0.26	0.01	0.33	0.04	0.14	—0.22	0.02	0.07	0.09	0.20	0.23	0.07	Diff. from daily mean.
Beregnet Afvigelse	—0.11	—0.07	—0.03	0.02	0.07	0.09	0.11	0.10	0.09	0.08	0.06	0.05	Computed difference.
Forskjel: Obs.—Ber.	—0.15	0.08	0.36	0.02	0.07	—0.31	—0.09	—0.03	0.00	0.12	0.17	0.02	Diff.: obs. — comp.

Formel (*Formula*): $W_t = 8.^m02 + 0.^m103 \sin(116^0\, 8.'6 + t) - 0.^m047 \sin(98^0\, 6' + 2t)$.

Figuren Pl. III, Vindens Hastighed 1878 viser den observerede og den beregnede Curve. MF = ± 0.^{m}11.

Af Formelen beregnes:

Maximum: + 0.^{m}11, 7^h 38^m p.m.
Minimum: — 0.^{m}15, 11^h 12^m a.m.

Medium indtræffer: 6^h 9^m a. m. og 3^h 35^m p.m.

Amplitude: 0.^{m}26.

Den observerede Curve antyder et Minimum, — 0.^{m}3, omkring Kl. 11 Formiddag, et Maximum, + 0.^{m}24, Kl. 3—4 Eft., et Minimum, — 1.^{m}2, Kl. 6 Eftermiddag, og et Maximum, + 0.^{m}2, Kl. 10—11 Aften. Curven faar saaledes mere Lighed med de tidligere Aars, der have Eftermiddagsminimum og Nattemaximum.

The figure in Pl. III. Velocity of the Wind, 1878, shows the observed and the computed curve. MF = ± 0.^{m}11.

From the formula were computed —

Maximum + 0.^{m}11, 7^h 38^m p.m.
Minimum — 0.^{m}15, 11^h 12^m a.m.

The Mean occurs at 6^h 9^m a.m. and 3^h 35^m p.m.

Total Range: 0.^{m}26.

The observed curve gives a minimum, — 0.^{m}3, about 11 a.m., a maximum, + 0.^{m}24, at 3—4 p.m., a minimum, — 1.^{m}2, at 6 p.m., and a maximum, + 0.^{m}2, at 10—11 p.m. The curve exhibits accordingly greater resemblance to that for the preceding years, which have an afternoon minimum and a night maximum.

1877.

Gruppe A, den varme Strøm, væsentlig udenfor Norges Kyst mellem 66° og 71° Bredde. De samme 20 Dage som ved Luftens Temperatur.

1877.

Group A, in the warm current, for the greater part off the coast of Norway, between 66° and 71° N. lat. The same days, 20, as for the temperature of the air.

Den (*on the*) 16 Juni (*of June*) 1 ^{h} a.m., var Havfladens Temperatur (*the surface-temperature of the sea was*) 8.°4.
„ „ 23 „ „ „ „ „ 7.°5.

Forskjel (*Difference*) 0.°9 : 7 = 0.°13 = *c*.

Den (*on the*) 28 Juni (*of June*) 12 ^{h} p.m., var Havfladens Temperatur (*the surface-temperature of the sea was*) 8.°7.
„ „ 30 „ „ „ „ „ 7.°8.

Forskjel (*Difference*) 0.°9 : 2 = 0.°45 = *c*.

Den (*on the*) 3 Juli (*of July*) 1 ^{h} a.m., var Havfladens Temperatur (*the surface-temperature of the sea was*) 9.°0.
„ „ 8 „ „ „ „ „ 8.°0.

Forskjel (*Difference*) 1.°0 : 5 = 0.°20 = *c*.

Den (*on the*) 16 Juli (*of July*) 1 ^{h} a.m., var Havfladens Temperatur (*the surface-temperature of the sea was*) 9.°4.
„ „ 20 „ „ „ „ „ 7.°8.

Forskjel (*Difference*) 1.°6 : 4 = 0.°40 = *c*.

Den (*on the*) 25 Juli (*of July*) 1 ^{h} a.m., var Havfladens Temperatur (*the surface-temperature of the sea was*) 8.°2.
„ „ 27 „ „ „ „ „ 8.°0.

Forskjel (*Difference*) 0.°2 : 2 = 0.°10 = *c*.

For den hele Gruppe bliver $c = + 0.°23$.

For the whole group, $c = + 0.°23$.

a. m.

Klokkeslet	1 ^{h}	2 ^{h}	3 ^{h}	4 ^{h}	5 ^{h}	6 ^{h}	7 ^{h}	8 ^{h}	9 ^{h}	10 ^{h}	11 ^{h}	12 ^{h}	Hour.
Corr. Obs.media	7.94	7.86	7.67	7.66	8.28	8.29	8.33	8.32	8.32	8.36	8.50	8.49	Corr. obs. means.
Afv.fra Dagsmedium	—0.33	—0.41	—0.60	—0.61	0.01	0.02	0.06	0.05	0.05	0.09	0.23	0.22	Diff. from daily mean.
Beregnet Afvigelse	—0.30	—0.39	—0.42	—0.38	—0.29	—0.16	—0.02	0.10	0.17	0.20	0.18	0.13	Computed difference.
Forskjel: Obs — Ber.	—0.03	0.02	—0.18	—0.23	0.30	0.18	0.08	—0.05	—0.12	—0.11	0.05	0.09	Diff.: obs. — comp.

p. m.

Corr. Obs.media	8.31	8.31	8.27	8.24	8.53	8.43	8.45	8.43	8.42	8.39	8.34	8.34	Corr. obs. means.
Afv. fra Dagsmedium	0.04	0.04	0.00	—0.03	0.26	0.16	0.18	0.16	0.15	0.12	0.07	0.07	Diff. from daily mean.
Beregnet Afvigelse	0.08	0.04	0.03	0.06	0.12	0.19	0.24	0.25	0.21	0.12	—0.01	—0.16	Computed difference.
Forskjel: Obs.—Ber.	—0.04	0.00	—0.03	—0.09	0.14	—0.03	—0.06	—0.09	—0.06	0.00	0.08	0.23	Diff.: obs. — comp.

Formel (*Formula*): $\tau_t = 8.°27 - 0.°227 \sin (39° 44.'2 + t) - 0.°194 \sin (4° 38' + 2t)$.

Figuren Pl. III, Havfladens Temperatur 1877 A, viser den observerede og den beregnede Curve. MF = ± 0.°093.

Af Formelen beregnes:

Minimum: — 0.°42, 2 ^{h} 58 ^{m} a.m.;
„ + 0.°03, 2 ^{h} 36 ^{m} p.m.;

Medium indtræffer 7 ^{h} 9 ^{m} a.m. og 10 ^{h} 55 ^{m} p.m.
Amplitude: 0.°68.

The figure in Pl. III, Temperature of Sea-Surface, 1877 A, shows the observed and the computed curve. MF = ± 0.°093.

From the formula were computed —

Maximum: + 0.°26, 7 ^{h} 45 ^{m} p.m.
„ + 0.°20, 10 ^{h} 1 ^{m} a.m.

The Mean occurs at 7 ^{h} 9 ^{m} a.m and 10 ^{h} 55 ^{m} p.m.
Total Range: 0.°68.

Den beregnede Curve slutter sig ikke særdeles nøje til den observerede, hvortil Grunden væsentlig ligger i det sterke Sprang mellem Observationerne Kl. 4 og 5 Morgen.

The computed curve does not correspond very closely with that observed, which must be chiefly ascribed to the sudden variation between the observations taken at 4 and those taken at 5 o'clock in the morning.

Gruppe B. 9 Dage i Polarstrømmen ved Jan Mayen.

Group B, 9 days; in the Polar current off Jan Mayen.

Den (*on the*) 28 Juli (*of July*) 1[h] a.m., var Havfladens Temperatur (*the surface-temperature of the sea was*) 3.°6.
" " 6 Aug. (*of Aug.*) " " 5.°2.
Forskjel (*Difference*) — 1.°6 : 9 = — 0.°18 = *c*.

a. m.

Klokkeslet	1[h]	2[h]	3[h]	4[h]	5[h]	6[h]	7[h]	8[h]	9[h]	10[h]	11[h]	12[h]	Hour.
Corr. Obs.media	3.02	3.17	3.02	2.99	3.28	3.36	3.33	3.34	3.54	3.53	3.69	3.84	Corr. obs. means.
Afv. fra Dagsmedium	—0.44	—0.29	—0.44	—0.47	—0.18	—0.10	—0.13	—0.12	0.08	0.07	0.23	0.38	Diff. from daily mean.
Beregnet Afvigelse	—0.21	—0.31	—0.37	—0.38	—0.33	—0.24	—0.13	0.00	0.10	0.18	0.22	0.22	Computed difference.
Forskjel: Obs.—Ber	—0.23	0.02	—0.07	—0.09	0.15	0.14	0.00	—0.12	—0.02	—0.11	0.01	0.16	Diff.: obs. — comp.

p. m.

Corr. Obs.media	3.54	3.66	3.67	3.50	3.58	3.49	3.59	3.64	3.57	3.56	3.56	3.48	Corr. obs. means.
Afv. fra Dagsmedium	0.08	0.20	0.21	0.04	0.12	0.03	0.13	0.18	0.11	0.10	0.10	0.02	Diff. from daily mean.
Beregnet Afvigelse	0.20	0.16	0.12	0.11	0.11	0.12	0.15	0.15	0.14	0.09	0.00	—0.10	Computed difference.
Forskjel: Obs.—Ber.	—0.12	0.04	0.09	—0.07	0.01	—0.09	—0.02	0.03	—0.03	0.01	0.10	0.12	Diff.: obs. — comp.

Formel (*Formula*): $r_t = 3.°46 - 0.°245 \sin(41° 13.'9 + t) + 0.°135 \sin(153° 28' + 2t)$.

Figuren Pl. III. Havfladens Temperatur 1877 B, viser den observerede og den beregnede Curve. MF = ± 0.°077.

Af Formelen beregnes:

Minimum: — 0.°38, 3[h] 41[m] a.m.;
" + 0.°10, 4[h] 25[m] p.m.;

Medium indtræffer: 8[h] 5[m] a.m. og 11[h] 0[m] p.m.
Amplitude: 0.°61.

The figure in Pl. III. Temperature of Sea-Surface, 1877 B, Polar Current, shows the observed and the computed curve. MF = ± 0.°077.

From the formula were computed —

Maximum: + 0.°23. 11[h] 31[m] a.m.
" + 0.°15. 7[h] 34[m] p.m.

The Mean occurs at 8[h] 5[m] a.m. and 11[h] 0[m] p.m.
Total Range: 0.°61.

1878.

Første Gruppe omfatter kun Observationerne fra Østhavet, Juni 28 til Juli 7, 10 Dage. De øvrige Observationer fra Søen ere ikke blevne benyttede til Beregning af nogen daglig Periode, da Expeditionen flere Gange sejlede

1878.

The first group comprises only the observations from the Barents' Sea; June 28th to July 7th, 10 days. The remaining observations have not been applied to the computation of a diurnal period, since the Expedition several

fra den varme Strøm ind i Polar Strømmen og omvendt, hvorved der er gjort et altfor voldsomt Brud paa Stedets Enhed.

times passed direct from the warm into the Polar current, and *vice versa,* thus occasioning too violent a disruption in the unity of place.

Den (*on the*) 28 Juni (*of June*) 1^h a.m., var Havfladens Temperatur (*the surface-temperature of the sea was*) 5.°2.
" " 8 Juli (*of July*) " " " 7.°3.
Forskjel (*Difference*) — 2.°1 : 10 = — 0.°21 = *c*.

Fejlen i Observationsklokkeslettet ved Middag er størst, — 30.ᵐ3, den 3die Juli og næststørst, + 24.ᵐ0, den 7de Juli. Summen af positive Fejl er + 37.ᵐ1, fordelt paa 3 Dage, eller + 12.ᵐ4 pr. Dag. Summen af negative Fejl er — 85.ᵐ9, fordelt paa 7 Dage, eller — 12.ᵐ3 pr. Dag. Den gjennemsnitlige Fejl er — 48.ᵐ8, fordelt paa 10 Dage, eller — 4.ᵐ88 pr. Dag.

The error in the hour of observation at noon was greatest, — 30.ᵐ3, July 3rd; the next greatest, + 24.ᵐ0, occurred July 7th. The sum of the positive errors is + 37.ᵐ1, distributed over 3 days, or + 12.ᵐ4 per day. The sum of the negative errors is — 85.ᵐ9, distributed over 7 days, or — 12.ᵐ3 per day. The average error is accordingly — 48.ᵐ8, distributed over 10 days, or — 4.ᵐ88 per day.

a. m.

Klokkeslet	1^h	2^h	3^h	4^h	5^h	6^h	7^h	8^h	9^h	10^h	11^h	12^h	Hour.
Corr. Obs.media	4.57	4.62	4.57	4.63	4.57	4.59	4.64	4.70	4.81	4.84	4.86	4.97	Corr. obs. means.
Afv. fra Dagsmedium	—0.24	—0.19	—0.24	—0.18	—0.24	—0.22	—0.17	—0.11	0.00	0.03	0.05	0.16	Diff. from daily mean.
Beregnet Afvigelse	—0.20	—0.21	—0.21	—0.20	—0.20	—0.18	—0.16	—0.12	—0.07	—0.01	0.06	0.14	Computed difference.
Forskjel: Obs.—Ber.	—0.04	0.02	—0.03	0.02	—0.04	—0.04	—0.01	0.01	0.07	0.04	—0.01	0.02	Diff.: obs. — comp.

p. m.

Corr. Obs.media	4.90	4.94	5.16	5.27	5.07	5.06	4.99	4.77	4.57	4.89	4.72	4.68	Corr. obs. means.
Afv. fra Dagsmedium	0.09	0.13	0.35	0.46	0.26	0.25	0.18	—0.04	—0.24	0.08	—0.09	—0.13	Diff. from daily mean.
Beregnet Afvigelse	0.21	0.26	0.29	0.30	0.27	0.22	0.14	0.06	—0.02	—0.09	—0.14	—0.18	Computed difference.
Forskjel: Obs.—Ber.	—0.12	—0.13	0.06	0.16	—0.01	0.03	0.04	—0.10	—0.22	0.17	0.05	0.05	Diff.: obs. — comp.

Formel (*Formula*): $t_t = 4.^\circ 81 - 0.^\circ 253 \sin (38^\circ\ 16.'3 + t) - 0.^\circ 048 \sin (156^\circ\ 39' + 2t)$.

Figuren Pl. III, Havfladens Temperatur 1878 A, viser den observerede og den beregnede Curve. MF = ± 0.°062.

Af Formelen beregnes:

Minimum: — 0.°21, 2^h 37^m a.m.
Maximum: + 0.°30, 3^h 57^m p.m.

Medium indtræffer: 10^h 7^m a.m. og 8^h 46^m p.m.
Amplitude: 0.°51.

The figure in Pl. III, Temperature of Sea-Surface, 1878 A, shows the observed and the computed curve. MF = ± 0.°062.

From the formula were computed —

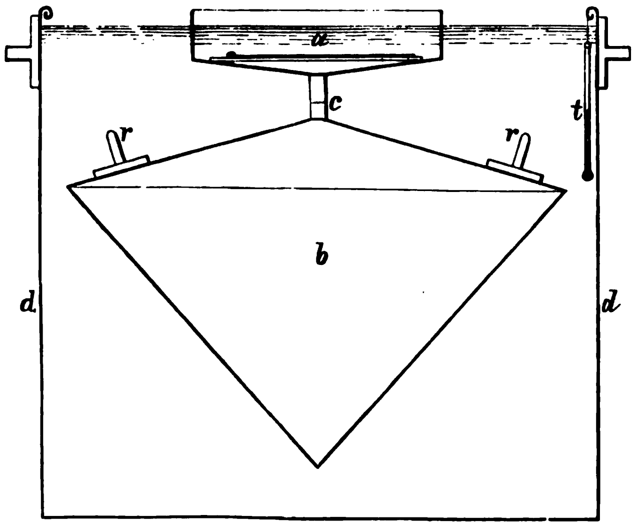
Minimum — 0.°21, 2^h 37^m a.m.
Maximum + 0.°30, 3^h 57^m p.m.

The Mean occurs at 10^h 7^m a.m. and 8^h 46^m p.m.
Total Range: 0.°51.

Heraf sees, at i Sommermaanederne var Havet søndenfor Polarcirkelen lidt koldere end Luften, men nordenfor Polarcirkelen var Havets Overflade varmere end Luften. Havoverfladens Temperatur varierede i Døgnets Løb meget mindre end Luftens.

From the above comparison, it appears that in the summer months the sea south of the Polar Circle was a trifle colder than the air, whereas north of the Polar Circle the sea-surface was warmer than the air. The temperature of the sea-surface varied considerably less in the course of the day than did that of the air.

Kar *dd* er fyldt. Dette kalder jeg i det følgende „det ydre Vand“. Hele Apparatet er gjort af lakeret Jernblik. Naar Fordunstningsskaalen er tom, er Stetten *c* og en Del af Bøjen over Vandet, men naar naar man helder Søvand



⅕

Fig. 12.

i Skaalen, synker Bøjen, og Instrumentet er færdigt til Forsøg, naar det ydre Vand har naaet et Merke paa Stetten. Vandet staar da i Fordunstningsskaalen en Centimeter under den øverste Rand. Idet nu Fordunstningen gaar for sig, bliver Vægten af Vandet i Skaalen *a* mindre og mindre, og hele det flydende Apparat løfter sig. For at finde, hvormeget Vand der er fordunstet, helder man af en Burette rent Vand i *a* indtil man ser Merket paa Stetten i Højde med den omgivende ydre Vandflade. Det fordunstede Vand, der er rent Vand, er da erstattet fra Buretten, paa hvilken dets Volum kan aflæses. Da Overfladen af *a* er 225 Kvadratcentimeter, vil en Vandmængde af 22.5 Kubikcentimeter fra Buretten svare til en Fordunstningshøjde af 1 Millimeter.

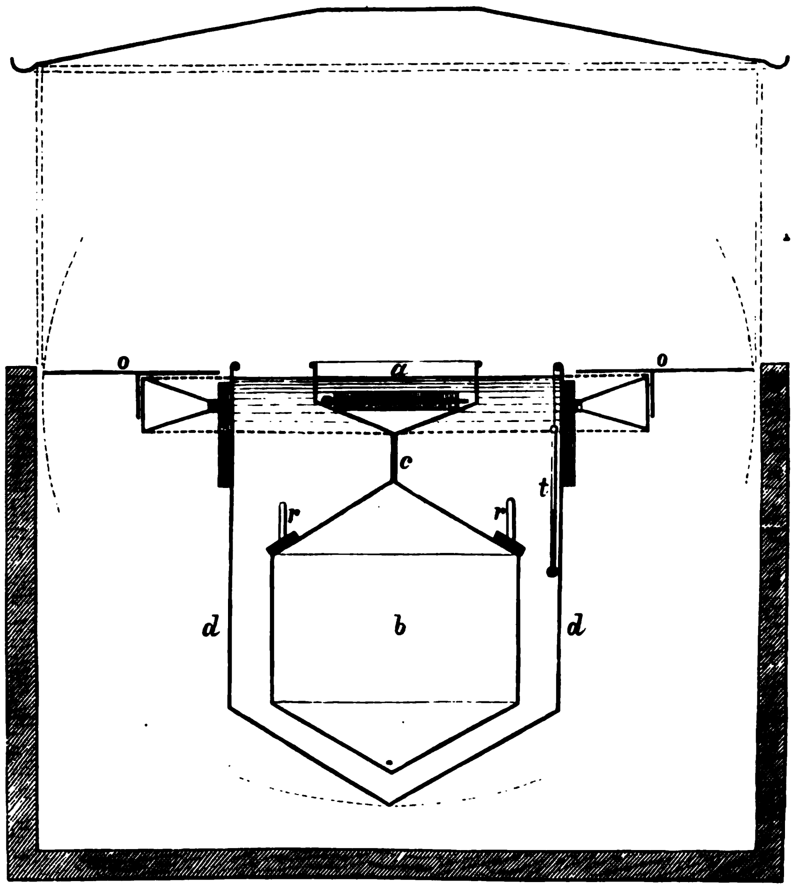
Dersom Fordunstningsskaalen stod frit over det ydre Vand, omgivet af Luften, vilde dens Vand i Regelen antage en Temperatur adskilligt højere end den større ydre Vandmasses i Karret *dd*, og være underkastet en større daglig Temperaturvariation end denne. Bøjen vilde ogsaa, i haardt Vejr, være tilbøjelig til at slænge Vandet ud af Skaalen. Jeg indrettede mig derfor paa følgende Maade: Saasnart Instrumentet var paa Merke, blev en Blyring med to Haandtag *rr* lagt paa Bøjen. Med denne Belastning blev hele det flydende Apparat sænket saa meget, at den indre Vandflade i *a* stod i samme Højde som den ydre Vandflade i *dd*. Den fordunstende Vandflade i *a* stod nu omgivet af en ligeledes fordunstende Vandflade af samme Art, Niveau og Temperatur, analog med en Del af selve Havfladen. Ved Forsøgets Afslutning tages Blyringen af.

water, with which the large cylindrical vessel *dd* is filled. This I shall call in the sequel “the outer water”. The whole apparatus is made of japanned sheet-iron. When the evaporating dish is empty, the stem *c* and part of the buoy are above water; but on pouring sea-water into the dish, the buoy sinks, and when the outer water has risen to a mark on the stem, the instrument is ready for use. The water in the evaporating dish is then one centimetre below the upper margin. Now, as evaporation goes on, the weight of the water in the dish *a* gradually diminishes, and the whole of the floating apparatus rises. In order to find how much water has evaporated, fresh water is poured from a burette into *a* till the surface of the outer water is on a level with the mark on the stem. The evaporated water, which is fresh water, is then restored from the graduated burette, on which its volume can be read off. The surface of *a* measuring 225 square centimetres, 22.5 cubic centimetres of water from the burette represent in height 1 millimetre of evaporated sea-water.

If the evaporating dish were kept free above the outer water, surrounded by the air, the water it contains would as a rule take a temperature considerably higher than that of the greater mass of water in the outer vessel *dd*, and be subject to greater variations of temperature. Moreover, in a rough sea the buoy would be more liable to throw the water out of the dish. I adopted, therefore, the following arrangement: — The instrument being adjusted to the mark, a leaden ring, with two handles *rr* was laid upon the buoy. With this ballast, the whole floating apparatus was so much depressed that the surface of the inner water in *a* was on a level with the surface of the outer water in *dd*. The evaporating surface of the water in *a* was thus surrounded by an evaporating surface of the same nature, level, and temperature, in every respect

ningsskaalen har en fri Overflade af 100 Kvadratcentimeter, saaledes at en Kubikcentimeter Vand svarer til en Fordunstningshøjde af 0.1 Millimeter. Stetten er smalere end i det ældre Apparat og Bøjen er af cylindro-conisk Form. Fordunstningsskaalen er forholdsvis dybere, og paa Bunden af den ligger en Rist af tynde paa Højkant staaende Metalstriber, hvormed Hensigten er at hindre sterkere Bevægelser af Fordunstningsvandet fra at slynge Vandet ud over Skaalens Rand. Paa denne Rist ligger det indre Thermometer. Fordunstningsskaalen og Stetten ere fortin-

The evaporating dish has a free surface measuring 100 square centimetres, so that 1 cubic centimetre corresponds in height to 0.1 millimetre of evaporated water. The stem is narrower than that of the former apparatus, and the buoy cylindro-conical in form. The evaporating dish is relatively deeper, and has at the bottom a grating of thin metallic strips, the object of which is to prevent the water from being splashed over the brim of the dish by any sudden and violent movement. On this grating the inner thermometer is laid. The evaporating dish and the stem are



1/5

Fig. 13.

nede og Bøjen lakeret. Det ydre Kars Bevægelser i Slingrebøjlerne er gjort fuldkomnere. Hele Apparatet hænger inde i en firkantet Trækasse, og den øvre Aabning mellem det ydre svingende Kar og Trækassen er dækket af et Jernpladelaag *oo*, der svinger med den ydre Ring i Slingrebøjlerne. Et Bliktag, med fire Vandrender, der hviler paa fire tynde Jernstænger, dækker hele Apparatet og beskytter det mod Regn, Sod og andre Ulemper. I dette Apparat gik Temperaturen ikke meget højere op end den var i Luften og i Havet, og Observationerne kunde gjøres i temmelig uroligt Vejr. Det stod paa Agterkappen, frit

tinned, and the buoy japanned. The outer vessel moves with greater freedom in the gimbals. The whole apparatus is enclosed in a square wooden box, and the upper opening between the outer vessel, swinging in gimbals, and the wooden box, is closed by a sheet-iron cover *oo*, that swings with the outer ring of the gimbals. A thin metal roof, provided with four water-tubes, resting on four slender iron pillars, covers the whole apparatus, and protects it from rain, soot, and other causes of injury. In this apparatus the temperature did not rise much above that of the air or the sea, and observations could be taken in comparatively

udsat for Vinden. I det følgende kalder jeg det ældre Apparat for *A*, det nye *B*.

Jeg skal nu først undersøge de forskjellige Fejlkilder og deres Indflydelse paa de med Fordunstningsmaalerne erholdte Resultater.

1. *Fordunstningsskaalens Diameter.* Kaldes Skaalens Radius *r*, en liden Fejl i samme i *dr*, dens frie Overflade *O*, en liden Fejl i samme *dO*, saa har man

$$O = \pi r^2;\ dO = 2\pi r\,dr;\ \frac{dO}{O} = \frac{2}{r}\,dr.$$

Ved Fordunstningsmaaleren *A* er $O = 225$ qcm., $r = 84.^{mm}63$, $\frac{dO}{O} = \frac{dr}{42.3}$. Sættes $dr = 0.^{mm}5$, faaes $\frac{dO}{O} = 0.0118$ eller 1.18 pro Cent. I samme Forhold vil Fordunstningshøjden forandre sig. Den største maalte Fordunstningshøjde er 6^{mm}. $6^{mm} \times 0.0118$ giver $0.^{mm}07$.

Ved Fordunstningsmaaleren *B* er $O = 100$ qcm., $r = 56.^{mm}42$; $\frac{dO}{O} = \frac{dr}{28.2}$. Med $dr = 0.^{mm}5$ faaes $\frac{dO}{O} = 0.0177$ eller 1.77 pro Cent. $6^{mm} \times 0.0177 = 0.^{mm}106$.

En Nøjagtighed af $0.^{mm}1$ i Bestemmelsen af Fordunstningshøjden er antageligvis den største, som i Regelen kan naaes tilsøs. Man ser, at Fordunstningskarrets Diameter kan være indtil en hel Millimeter for stor eller for liden uden at denne Grænse overskrides under de paa Expeditionen stedfundne Fordunstningsforhold.

2. *Den specifiske Vægt af det fra Buretten i Fordunstningsskaalen heldte Vand.* Naar det Antal Kubikcentimeter Vand, der heldes af Buretten, skal repræsentere Vægten af det fordunstede Vand i Gram, skulde det være destilleret Vand ved en Temperatur af 4° *C*. Kaldes den specifiske Vægt af rent Vand ved 4° *C* for S_0, og af det ved Forsøget anvendte Vand for *S*, det udheldte Antal Kubikcentimeter *c*, og dette Vands Vægt i Gram C_0, saa har man

$$\frac{C_0}{c} = \frac{S}{S_0};\ \frac{C_0 - c}{c} = \frac{S - S_0}{S_0};\ C_0 - c = c\,\frac{S - S_0}{S_0} = c\left(\frac{S}{S_0} - 1\right).$$

Ved Fordunstningsmaaleren *B* svarer en Kubikcentimeter Vand til en Fordunstningshøjde af $0.^{mm}1$. Sættes $C_0 - c = \pm 1$, $c = 60$ cbcm. (den højeste observerede Værdi) faar man

$$\frac{S}{S_0} = 1 \pm \frac{1}{60} = 1.0167 \text{ eller } 0.9833$$

altsaa: den specifiske Vægt af Vandet i Buretten kan være saa høj som 1.0167 eller saa lav som 0.9833 uden at foraarsage en Fejl i Fordunstningshøjden, der overskrider $0.^{mm}1$. Rent Vand af 20° har en specifisk Vægt af 0.9982.

rough weather. It was mounted on the cap of the after hatch, freely exposed to the wind. In the sequel, I shall call the original apparatus *A* and the new one *B*.

I will now investigate the different sources of error likely to influence the results obtained with the atmometer.

1. *Diameter of Evaporating Dish.* — Calling the radius *r*, a small error therein *dr*, its free surface *O*, a small error therein *dO*, we have

$$O = \pi r^2;\ dO = 2\pi r\,dr;\ \frac{dO}{O} = \frac{2}{r}\,dr.$$

In the atmometer *A*, we have $O = 225$ square cm., $r = 84.^{mm}63$, $\frac{dO}{O} = \frac{dr}{42.3}$. Now, putting $dr = 0.^{mm}5$, we get $\frac{dO}{O} = 0.0118$, or 1.18 per cent. In the same ratio will the height of the water evaporated vary. The greatest measured evaporation was 6^{mm}. $6^{mm} \times 0.0118 = 0.^{mm}07$.

In the atmometer *B*, $O = 100$ square cm., $r = 56.^{mm}42$. $\frac{dO}{O} = \frac{dr}{28.2}$. With $dr = 0.^{mm}5$, we have $\frac{dO}{O} = 0.0177$, or 1.77 per cent. $6^{mm} \times 0.0177 = 0.^{mm}106$.

An accuracy of $0.^{mm}1$ in determinations of the depth of the water evaporated, is probably, as a rule, the extreme limit attainable at sea. Hence, there may be an error of a whole millimetre — too great or too small — in the diameter of the evaporating dish without exceeding this limit in any of the evaporation experiments performed on the Expedition.

2. *The specific gravity of the water poured from the burette into the evaporating dish.* If the number of cubic centimetres of water poured from the burette be assumed to represent the weight of the evaporated water in grammes, the water should be distilled water of a temperature of 4° *C*. Calling the specific gravity of distilled water at 4° *C*, S_0, and of the water used in the experiment *S*, the number of cubic centimetres poured out *c*, and the weight in grammes of the said water C_0, we have

$$\frac{C_0}{c} = \frac{S}{S_0};\ \frac{C_0 - c}{c} = \frac{S - S_0}{S_0};\ C_0 - c = c\,\frac{S - S_0}{S_0} = c\left(\frac{S}{S_0} - 1\right).$$

In the atmometer *B*, one cubic centimetre of water corresponds to a depth of $0.^{mm}1$. Putting $C_0 - c = \pm 1$, $c = 60$ cubic centimetres (the highest observed value), we have

$$\frac{S}{S_0} = 1 \pm \frac{1}{60} = 1.0167 \text{ or } 0.9833,$$

that is, the specific gravity of the water in the burette may be as high as 1.0167 or as low as 0.9833 without occasioning an error in the depth of the water evaporated that exceeds $0.^{mm}1$. Distilled water at 20° *C* has a specific gravity

Almindeligt Drikkevand foraarsager følgelig ingen mærkelig Fejl, og heller ikke smaa Fejl i Burettens Inddeling.

I det Tilfælde, at Regnhøjden, ved Fordunstningsmaaleren A, er større end Fordunstningshøjden, og der saaledes maa tages noget Vand ud af Fordunstningsskaalen for at faa Instrumentet paa Merke, er dette Vand salt og har en højere specifisk Vægt. Sættes denne, med en temmelig høj Værdi, til 1.027, den med Pipetten optagne Vandmængde til 97 Kubikcentimeter (som Tilfældet var den 9de Juni 1876) faaes:

$$C_0 - c = 97\ (1.027 - 1) = 97 \times 0.027 = 2.62.$$

2.62 Gram eller Kubikcentimeter Vand svarer til en Fordunstningshøjde af $\frac{2.62}{22.5}$ eller $0.^{mm}12$. Denne Correction er nær Nøjagtighedens Grænse.

3. *Virkningen af Temperaturens Forandring i det ydre Vand, hvori Bøjen flyder.* Kaldes Vægten af Bøjen med Stet, Skaal og Vand, naar Instrumentet staar paa Merke: p, Bøjens Rumfang under Merket, ved 0^0 C: V_0, den specifiske Vægt af Vandet, i hvilket Bøjen flyder, ved 0^0: S, dets specifiske Vægt ved t^0: S_t, Udvidelsescoefficienten for 1^0 C af Bøjens Materiale: α, og Forskjellen i Apparatets Vægt i Vand af 0^0 og i Vand af t^0, Merket i Vandkanten: x_t, saa har man

$$V_0\ S_0 = p.$$
$$V_0\ (1 + 3\,\alpha\, t)\ S_t = p - x_t$$

Ved Subtraction: $V_0\ (S_0 - (1 + 3\,\alpha\, t)\ S_t) = x_t$

og $x_t = V_0\ S_0 \left(1 - \frac{S_t}{S_0}\ (1 + 3\,\alpha\, t)\right).$

Forholdet S_t: S_0 findes af H. Tornøes Tabel i hans Afhandling „Om Saltholdigheden af Vandet i det norske Nordhav" Side 52. Kaldes Volumet ved 0^0: v_0, Volumet ved t^0: v_t, saa har man

$$\frac{S_t}{S_0} = \frac{v_0}{v_t} \text{ og } x_t = V_0\ S_0 \left(1 - \frac{v_0}{v_t}\ (1 + 3\,\alpha\, t)\right).$$

Ved Fordunstningsmaaleren A er V_0 6560 Kubikcentimeter, og med $S_0 = 1.027$, faar man $V_0\ S_0 = 6735$ Gram. Ved B er $V_0 = 2712$ cbcm. og $V_0\ S_0 = 2785$ g. Da Jernets lineare Udvidelsescoefficient er 0.0000122, bliver $3\,\alpha = 0.0000366$. Med disse Værdier faaes:

$$\text{For A, } x_t = 6735 \left(1 - \frac{v_0}{v_t}\ (1 + 0.0000366\ t)\right).$$
$$\text{For B, } x_t = 2785 \left(1 - \frac{v_0}{v_t}\ (1 + 0.0000366\ t)\right).$$

Den følgende Tabel giver Værdien af x_t for hver Grads Temperatur mellem 0^0 og 20^0 C.

of 0.9982. Hence, common drinking water causes no appreciable error, nor do trifling errors in the graduation of the burette.

When the depth of fallen rain in the atmometer A exceeds that of the water evaporated, and water has to be taken from the evaporating dish to restore the equilibrium, this water is salt and has a higher specific gravity. Putting this specific gravity at 1.027 (a rather high value), the quantity of water taken up with the pipette at 97 cubic centimetres (as actually observed June 9th 1876), we have

$$C_0 - c = 97\ (1.027 - 1) = 97 \times 0.027 = 2\ 62.$$

Now, 2.62 grammes or cubic centimetres of water correspond to a depth of evaporation of $\frac{2.62}{22.5}$, or $0.^{mm}12$. This correction approximates the limit of accuracy.

3. *The effect of change of temperature of the outer water in which the buoy is floating.* Let p be the weight of the buoy, along with the stem, dish, and water, when the instrument is adjusted to the mark, V_0 the volume of the buoy below the mark at 0^0 C, S the specific gravity of the water in which the buoy floats at 0^0 C, S_t its specific gravity at t^0 C, α the coefficient of dilatation for 1^0 C of the material of which the buoy is made, and x_t the difference in the weight of the apparatus in water of 0^0 and in water of t^0 (the mark on the stem at the surface), we have

$$V_0\ S_0 = p$$
$$V_0\ (1 + 3\,\alpha\, t)\ S_t = p - x_t$$

By subtraction $V_0\left(S_0 - (1 + 3\,\alpha\, t)\ S_t\right) = x_t$

and $x_t = V_0\ S_0 \left(1 - \frac{S_t}{S_0}\ (1 + 3\,\alpha\, t)\right).$

The ratio S_t: S_0 is found from H. Tornøe's Tables in his Memoir on "The Amount of Salt in the water of the Nowegian Sea", p. 52. Calling the volume at 0^0, v_0, the volume at t^0, v_t, we have

$$\frac{S_t}{S_0} = \frac{v_0}{v_t} \text{ and } x_t = V_0\ S_0 \left(1 - \frac{v_0}{v_t}\ (1 + 3\,\alpha\, t)\right).$$

In the atmometer A, V_0 is 6560 cubic centimetres, and with $S_0 = 1.027$, we have $V_0\ S_0 = 6735$ grammes. In the atmometer B. $V_0 = 2712$ ccm. and $V_0\ S_0 = 2785$ grammes. The coefficient of linear dilatation being for iron 0.0000122, $3\,\alpha = 0.0000366$. These values give

$$\text{For atmometer } A,\ x_t = 6735 \left(1 - \frac{v_0}{v_t}\ (1 + 0.0000366\ t)\right).$$
$$\text{For } — \quad B,\ x_t = 2785 \left(1 - \frac{v_0}{v_t}\ (1 + 0.0000366\ t)\right).$$

The following Table gives the value of x_t for every degree of temperature between 0^0 and 20^0 C.

t	A	B	t	A	B	t	A	B	t	A	B
0°	0.0	0.0	5	1.6	0.6	10	5.0	2.1	15	10.1	4.2
1	0.2	0.1	6	2.1	0.9	11	5.9	2.4	16	11.3	4.7
2	0.4	0.2	7	2.7	1.1	12	6.9	2.8	17	12.6	5.2
3	0.8	0.3	8	3.4	1.4	13	7.9	3.3	18	13.9	5.8
4	1.2	0.5	9	4.2	1.7	14	9.0	3.7	19	15.3	6.3
5	1.6	0.6	10	5.0	2.1	15	10.1	4.2	20	16.7	6.9

For en bestemt Temperatur har man:

$$\frac{dx_t}{x_t} = \frac{dS_0}{S_0} \text{ eller } dx_t = x_t \frac{dS_0}{S_0}$$

Lad S_0 variere fra 1.027 til 1.020, eller $dS_0 = 0.007$, saa faaes $dx_t = x_t \frac{0.007}{1.027} = 0.0068\ x_t$. Den højeste Værdi af x_t i Tabellen er for A 16.7; $16.7 \times 0.0068 = 0.11$.
„ B 6.9; $6.9 \times 0.0068 = 0.05$.

Tabellen er saaledes fuldkommen tilstrækkelig for alle de i Havet forekommende Værdier af den specifiske Vægt. Ved Forsøgene er det desuden kun Forskjeller mellem Værdierne af x_t, der komme til Anvendelse.

Dersom, ved Forsøgets Begyndelse, Instrumentet blev bragt paa Merke, idet det ydre Vands Temperatur var t, og det, ved Forsøgets Slutning, atter blev bragt paa Merke, idet det ydre Vands Temperatur var t', ved at der heldes f Gram eller f Kubikcentimeter rent Vand i Skaalen, saa vil, dersom t' er større end t, Bøjen have mindre Opdrift ved Slutningen end ved Begyndelsen, og Mængden af det fordunstede Vand er *større* end f Gram eller Kubikcentimeter. Forskjellen mellem disse to Størrelser eller den Correction, som maa lægges til de maalte f Kubikcentimeter, er lig Forskjellen mellem de Værdier af x_t, der svare til Temperaturerne t og t'. Er t' mindre end t, har Bøjen størst Opdrift ved Forsøgets Slutning, og kræver, for at nedtrykkes til Merket, en større Mængde Vand end den fordunstede. Correctionen bliver i dette Tilfælde at trække fra den maalte f. Ex. Fordunstningsmaaleren A stilles Kl. 9. a.m. paa Merke. Det ydre Vands Temperatur $t = 10°$. Vandet fordunster til kl. 9 p.m. Man finder da $t' = 15°$, og $f = 95$ cbcm. I Tabellen finder man for $t = 10°$: $x_t = 5.0$; for $t' = 15°$: $x_t = 10.1$. Den virkelig fordunstede Vandmængde er saaledes $95 + (10.1 - 5.0) = 95 + 5.1 = 100.1$ cbcm. Da Fordunstningsmaalerens Overflade er 225 qcm., bliver Fordunstningshøjden $\frac{100.1}{225}$ Centimeter eller 4.44 Millimeter i 12 Timer.

Forskjellen mellem Værdierne af x_t ved forskjellige Temperaturer kan findes ved Forsøg. Nogle saadanne an-

For a given temperature we have

$$\frac{dx_t}{x_t} = \frac{d\,S_0}{S_0} \text{ or } dx_t = x_t \frac{d\,S_0}{S_0}$$

Let S_0 vary from 1.027 to 1.020, or $d\,S_0 = 0.007$, we shall then have $dx_t = x_t . \frac{0.007}{1.027} = 0.0068\ x_t$. The highest value of x_t given in the Table is,
for atmometer A, 16.7; $16.7 \times 0.0068 = 0.11$;
„ — B, 6,9; $6.9 \times 0.0068 = 0.05$.

Hence, the Table is sufficiently accurate for all values of specific gravity found in the water of the ocean. Moreover, in the experiments undertaken, there is only question of the differences in the value of x_t.

If, at the beginning of an experiment, the buoy has been adjusted to the mark on the stem, the temperature of the outer water being t, and likewise at the close of the experiment, the temperature being t', by pouring into the evaporating dish f grammes, or f cubic centimetres of fresh water, then, provided t' be greater than t, the buoy will float deeper at the end than at the beginning of the experiment, and the quantity of water evaporated will be *greater* than f grammes, or cubic centimetres. The difference between these two quantities, or the correction to be applied to f, is equal to the difference between the values of x_t corresponding to the temperatures t and t'. When t' is less than t, the buoy floats higher at the end of the experiment, and requires, in order to depress it to the mark on the stem, a greater quantity of water to be poured into the evaporating dish than that evaporated. The correction has in such case to be subtracted from f. Let, *e. g.* the atmometer A, at 9 a.m., be adjusted to the mark on the stem, the temperature t of the outer water being 10°. The water is left evaporating till 9 p.m.; and t' will then be found equal to 15°, f to 95 cubic centimetres. In the Table we have $t = 10°$, $x_t = 5.0$; $t_t = 15°$, $x_t = 10.1$. The actual quantity of water evaporated is therefore $95 + (10.1 - 5.0) = 95 + 5.1 = 100.1$ ccm. The surface of the evaporating dish measuring 225 centimetres, the depth of the water evaporated is accordingly $\frac{100.1}{22.5}$ centimetres, or 4.44 millimetres in 12 hours.

The difference between the values of x_t at different temperatures can be found by experiment. With this

stillede jeg paa følgende Maade. Fordunstningsskaalen holdtes tør. Et lidet Glas sattes op i den, og den belastedes forresten med tørre Vægter, Sand og Hagel, til den kom paa Merke. Det ydre Vand var ved Forsøgets Begyndelse varmest, tildels opvarmet over Luftens Temperatur. Dets Temperatur noteredes, hvorpaa jeg lod det afkjøle, enten i Luften eller ved Hjelp af Sne omkring det ydre Kar. Paa forskjellige Stadier under denne Afkjøling aflæstes Vandets Temperatur og Bøjen bragtes ned paa Merke ved at helde rent Vand fra en Burette i det lille Glas. Efter hvert saadant Forsøg aftørredes Glasset omhyggeligt. Den i Glasset heldte Vandmængde udviser Forskjellen mellem Værdien af x_t ved den oprindelige højeste og ved de senere noterede lavere Temperaturer af det ydre Vand. Jeg gjorde to saadanne Forsøgsrækker med hver af Fordunstningsmaalerne. Af disse hidsættes de med *B* gjorte, den første i Christiania før Rejsen i 1877, den anden i Tromsø samme Sommer.

object in view, I proceeded as follows: — The evaporating dish was kept dry. A small glass vessel was put into the dish, which, besides, was loaded with dry weights, sand and shot, till the buoy had become depressed to the mark on the stem. At the beginning of the experiment, the outer water was warmest, being sometimes heated to a higher temperature than that of the air. Its temperature was noted, after which I let it cool, either by exposure to the air or with snow surrounding the outer vessel. At successive stages of the cooling, the temperature of the water was read off, and the buoy brought down to the mark on the stem by pouring fresh water from a burette into the small glass vessel. After each experiment the glass vessel was carefully dried. The quantity of water poured into the glass vessel represents the difference between the value of x_t at the original (maximum) temperature of the outer water and at the subsequently noted (lower) temperatures. I made two such series of experiments, with each of the atmometers. The following Table gives the series with atmometer B, the first of which was made in Christiania, previous to our departure on the cruise in 1877, the second in Tromsø during the course of the same summer.

Christiania.

Kubikcentimeter.

(*Cubic Centimetres*).

t	x_t	$x_{15}-x_t$	Obs.	Diff.
$15^0.0$	4.18	0.00	0.0	
12 .6	3.10	1.08	1.2	+ 0.1
11 .9	2.80	1.38	1.5	+ 0.1
11 .6	2.68	1.50	1.6	+ 0.1
9 .9	2.03	2.15	2.2	+ 0.05
9 .5	1.90	2.28	2.2	— 0.1

Tromsø.

Kubikcentimeter.

(*Cubic Centimetres*).

t	x_t	$x_{8.7}-x_t$	Obs.	Diff.
$8^0.7$	1.62	0.00	0.0	
6 .2	0.92	0.70	0.7	0.0
5 .1	0.67	0.95	0.9	0.0
4 .6	0.56	1 06	0.4	— 0.7
1 .9	0.16	1.46	1.1	— 0.4
1 .7	0.12	1.50	0.8	— 0.7

Forskjellerne mellem de observerede og beregnede Værdier ere, som man ser, mindre end den Nøjagtighed, som man kan opnaa i Søen.

4. *Under Fordunstningen voxer Vandets Saltholdighed,* hvorved Fordunstningen bliver langsommere. For at vise Virkningen heraf vil jeg tage et Exempel. Lad Vandets specifiske Vægt være ved Forsøgets Begyndelse 1.027. Vandet i Skaalen i *A* udgjør 623 cbcm., altsaa dets Vægt 623 × 1.027 eller 640 Gram. Til en specifisk Vægt af 1.027 svarer efter Prof. Karstens Tabeller 3.54 Procent Salt. 640 Gram Vand indeholder altsaa 22.65 Gram Salt. Den største Fordunstningsmængde, der maaltes med *A* er 125 cbcm., eller 125 Gram rent Vand. Ved Forsøgets Slutning var der altsaa 640 minus 125 eller 515 Gram Vand i Skaalen. I disse 515 Gram Vand indeholdes den hele Saltmængde, 22.65 Gram, eller Saltholdigheden er 4.40 Procent. Vandets specifiske Vægt er voxet fra 1.027 til 1.0336.

The differences between the observed and the computed values are much below the limit of accuracy attainable at sea.

4. *During evaporation the saltness of the water increases,* thus retarding the evaporating process. To show the effect of this phenomenon, I will give an instance in point. Let the specific gravity of the water at the beginning of the experiment be 1.027. The volume of the water in the evaporating dish *A* amounts to 623 cubic centimetres, and its weight is accordingly 623 × 1.027, or 640 grammes. To a specific gravity of 1.027 correspond, according to Professor Karstens's Tables, 3.54 per cent of salt; hence, 640 grammes of water contain 22.65 grammes of salt. The greatest evaporation found, in any one experiment with atmometer *A*, was 125 ccm., or 125 grammes of water. At the end of the experiment, there was consequently 630 minus 125, or 515 grammes of water in the

I Fordunstningsmaaleren B begynder Forsøget med en Vandmængde af 263 cbcm. eller en Vægt af 270 Gram, der indeholder 9.56 Gram Salt. Den største Fordunstningsmængde, der er maalt, er 60 cbcm. Ved Forsøgets Slutning indeholder Skaalen 270 minus 60 eller 210 Gram Vand, der holder 9.56 Gram Salt eller 4.55 pro Cent. Den specifiske Vægt er voxet fra 1.027 til 1.0347, altsaa mere end i det foregaaende Exempel.

Fordunstningshastigheden er, cæteris paribus, proportional med Forskjellen mellem Vanddampenes Maximumstryk (E) over den fordunstende Vædske og Vanddampenes-Tryk i Luften (e). Kaldes den i Tidsenheden fordunstede Vandmængde f, og er a en Constant, saa har man

$$f = a\ (E-e).$$

Antages e constant, har man

$$df = f\ \frac{dE}{E-e}$$

hvor df er den Correction, som skal lægges til f, naar E gaar over fra E til $E + dE$. Trykket E over Saltvand kan ifølge Wüllners Lov[1] sættes

$$E = E_0\left(1 - \alpha\ \frac{y}{x}\right)$$

hvor E_0 er Maximumstrykket af Dampene over rent Vand, α en Constant (der for Chlornatrium er 0.601), y Mængden af Salt og x Mængden af rent Vand. I vort Exempel fra Fordunstningsmaaleren B have vi Temperaturen af Fordunstningsvandet $7^0.6$, hvortil svarer $E_0 = 7.^{mm}78$ og Middelværdien af $e = 5.^{mm}15$ efter Psychrometret. Man faar saaledes følgende Regning.

evaporating dish. These 515 grammes of water contain the whole amount of salt, 22.65 grammes, or the proportion of salt is 4.40 per cent. Hence, the specific gravity of the water has increased from 1.027 to 1.0336.

In the atmometer B, the experiment begins with a volume of water of 263 ccm., or a weight of 270 grammes, containing 9.56 grammes of salt. The greatest evaporation measured was 60 ccm. At the end of the experiment, the evaporating dish contained 270 minus 60, or 210 grammes of water, with 9.56 grammes of salt, or 4.55 per cent. Hence, the specific gravity had increased from 1.027 to 1.0347, a greater value, therefore, than in the case given above.

The rate of evaporation is, *cæteris paribus*, proportionate to the difference between the maximum tension of the aqueous vapour (E) above the evaporating fluid and the tension of the aqueous vopour (e) present in the air. Let the quantity of water evaporated in the unit of time be f and a be a constant, we have then, $f = a\ (E-e)$.

Supposing e to be constant,

$$df = f\,\frac{dE}{E-e}$$

df representing the correction to be applied to f when E changes from E to $E + dE$. The tension E above the salt water can, according to Wüllner's law,[1] be put —

$$E = E_0\left(1 - \alpha\,\frac{y}{x}\right),$$

E_0 representing the maximum tension of the vapour above fresh water, α a constant (which for chloride of sodium is 0.601), y the amount of salt, and x the quantity of fresh water. In the example from the atmometer B, the mean temperature of the evaporating water was $7^0.6$, corresponding to $E_0 = 7.^{mm}78$, and the mean value of $e = 5.^{mm}15$, by the psychrometer. The computation from these data is as follows: —

	Ved Begyndelsen. (*At Commencement*).	Ved Slutningen. (*At End*).
$y =$	9.56	9.56
$x =$	270—9.56 = 260.44	210 — 9.56 = 200.44
$\frac{y}{x} =$	0.0367	0.0476
$\alpha\frac{y}{x} =$	0.02206	0.02861
$1-\alpha\frac{y}{x} =$	0.97794	0.97139
$E =$	7.62793	7.57684

[1] Poggendorffs Annalen, Bd. 103.

[1] Poggendorffs Annalen, Bd. 103.

Middelværdien af E under Forsøget er saaledes 7.60239, istedetfor den oprindelige Værdi 7.62793 eller $dE = -0.02554$ og vi faa

$$df = f \frac{-0.02554}{7.60-5.15} = -f \frac{0.02554}{2.45} = -0.0104 f.$$

Correctionen bliver 1.04 Procent af Fordunstningsmængden i Tidsenheden, og, da den hele Fordunstningsmængde, cæteris paribus, er proportional med denne, faa vi i vort Exempel en Correction af $-60 \times 0.0104 = -0.624$ cbcm. Den hele Correction naar saaledes ikke op til en Kubikcentimeter, Grænsen for Nøjagtigheden tilsøs. I Strøg, hvor Fordunstningen er raskere, bør Fordunstningsskaalen være rummeligere eller hellere Maalingerne gjøres hyppigere.

I 1877 stode begge Fordunstningsmaalere ved Siden af hverandre. Deres Resultater kunde saaledes sammenlignes. Observationerne gjordes i Regelen Kl. 9 Form. og Kl. 9 Aften. Resultatet af de anstillede Sammenligninger var følgende:

Hence, the mean value of E during the experiment to on was 7.60239, in place of the initial value, 7.62793, or $dE = 0.02554$, and this gives

$$df = f \cdot \frac{-0.02554}{7.60-5.15} = -f \cdot \frac{0.02554}{2.45} = -0.0104 f.$$

The correction is 1.04 per cent of the water evaporated in the given unit of time, and, since the total amount evaporated, *cæteris paribus*, is proportionate to the latter, we have in the example a correction of $60 \times 0.0104 = -0.624$ cbcm. The whole correction, therefore, does not amount to one cubic centimetre —, the limit attainable at sea. In localities where the evaporation is more rapid, the evaporating dish should have greater capacity, or the measurements be made at shorter intervals.

In 1877, the two atmometers were mounted side by side. The results of the observations could thus be compared. The observations were generally taken at 9 a.m. and at 9 p.m. The result of the comparisons was as follows: —

1877.	Dag *Day.*	Time. *Hour.*	Tidsrum. *Interval.*	Fordunstningshøjde. *Height of Water Evaporated.* *A*	 *B*	Forskjel. *Difference.* *A—B*
Juni (*June*)	12	9.ʰ5 a.m.— 9.ʰ0 p.m.	11.ʰ5	3.12ᵐᵐ	2.98ᵐᵐ	0.14ᵐᵐ
— —	12—13	9. 25 p.m.— 8. 75 a.m.	11. 5	1.31	1.54	—0.23
— —	13—14	8. 0 p.m.— 9. 5 a.m.	13. 5	1.44	1.86	—0.42
— —	14	10. 2 a.m.— 8. 5 p.m.	10. 3	3.09	2.29	0.80
— —	14—15	8. 75 p.m.— 8. 75 a.m.	12. 0	0.62	0.54	0.08
— —	15	9. 0 a.m.— 8. 75 p.m.	11. 75	1.20	1.01	0.19
— —	16—17	9. 7 a.m.— 9. 4 p.m.	11. 75	0.09	0.01	0.08
— —	19—20	8. 75 p.m.—10. 0 a.m.	13. 25	5.55	6.01	—0.46
— —	22	11. 3 a.m.— 9. 6 p.m.	10. 3	3.02	2.69	0.33
— —	22—23	9. 6 p.m.— 9. 5 a.m.	11. 9	2.37	1.25	1.12
— —	23—24	9. 5 a.m.— 5. 5 p.m.	32. 0	3.15	3.69	—0.54
— —	28	9. 5 a.m.—10. 0 p.m.	12. 5	2.38	2.77	—0.39
Juli (*July*)	9	11. 5 a.m— 7. 5 p.m.	8. 0	0.97	0.97	0.00
Sum:	Dagtimer (*Day Hours*)	. . . . .	75.ʰ8	13.87ᵐᵐ	12.72ᵐᵐ	1.15ᵐᵐ
„	Nattetimer (*Night Hours*)	. . . .	62. 2	11.29	11.17	0.12
„	Dag og Nat (*Day and Night*)	. . .	32.0	3.15	3.67	—0.52
Ialt (*Total*)		. . . .	170.ʰ00	28.31ᵐᵐ	27.56ᵐᵐ	+ 0.75ᵐᵐ

I det Hele taget give saaledes begge Fordunstningsmaalere meget nær samme Resultat. Summen af Tallene i den sidste Rubrik, uden Hensyn til Fortegn, er 4.76.

On the whole, both atmometers give accordingly very nearly the same result. The sum of the figures in the first column, without regard to sign, is 4.76, from which

1877. B.

No.		T	t	B	C	Q	H
1	Juni 12. $9.^{h}5$ *a.* *June* 12. 9. 0 *p.*	11.5	13.0 10.1	30.9	— 1.1	29.8	2.98
2	— 12. 9. 25 *p.* — 13. 8. 75 *a.*	11.5	10.6 14.0	14.0	+ 1.4	15.4	1.54
3	— 13. 8. 0 *p.* — 14. 9. 5 *a.*	13.5	10.8 15.7	16.4	+ 2.2	18.6	1.86
4	— 14. 10. 2 *a.* — 14. 8. 5 *p.*	10.3	10.8 13.0	22.0	+ 0.9	22.9	2.29
5	— 14. 8. 75 *p.* — 15. 8. 75 *a.*	12.0	13.0 10.5	6.4	— 1.0	5.4	2.54
6	— 15. 9. 0 *a.* — 15. 8. 75 *p.*	11.75	10.2 9.0	10.5	— 0.4	10.1	1.01
7	— 15. 8. 9 *p.* — 16. 9. 6 *a.*	12.7	9.2 9.5	0.0	+ 0.1	0.1	0.01
8	— 16. 9. 7 *a.* — 16. 9. 4 *p.*	11.7	9.5 8.9	4.0	— 0.2	3.8	0.38
9	— 16. 9. 5 *p.* — 17. 9. 5 *a.*	12.0	8.9 9.2	0.0	+ 0.1	0.1	0.01
10	— 17. 9. 5 *a.* — 17. 10. 5 *p.*	13.0	9.2 8.0	1.0	— 0.4	0.6	0.06
11	— 19. 10. 4 *a.* — 19. 8. 75 *p.*	10.35	9.3 7.0	27.0	— 0.7	26.3	2.63
12	— 19. 8. 75 *p.* — 20. 10. 0 *a.*	13.25	7.0 7.4	60.0	+ 0.1	60.1	6.01
13	— 20. 10. 0 *a.* — 30. 9. 25 *p.*	11.25	7.4 6.9	55.0	— 0.1	54.9	5.49
14	— 20. 9. 25 *p.* — 21. 9. 5 *a.*	12.25	6.9 7.0	16.8	0.0	16.8	1.68
15	— 21. 1. 0 *p.* — 21. 8. 75 *p.*	7.75	9.0 8.7	16.5	— 0.1	16.4	1.64
16	— 21. 8. 75 *p.* — 22. 9. 0 *a.*	12.25	8.7 11.5	16.0	+ 1.0	17.0	1.70
17	— 22. 11. 3 *a.* — 22. 9. 6 *p.*	10.3	12.2 9.2	28.0	— 1.1	26.9	2.69
18	— 22. 9. 6 *p.* — 23. 9. 5 *a.*	11.9	9.2 13.2	11.0	+ 1.5	12.5	1.25
19	— 23. 9. 5 *a* — 24. 5. 5 *p.*	32.0	13.2 8.2	38.5	— 1.8	36.7	3.67
20	— 28. 9. 5 *a.* — 28. 10. 0 *p.*	12.5	8.0 7.0	28.0	— 0.3	27.7	2.77
21	— 28. 10. 0 *p.* — 29. 9. 0 *a.*	11.0	7.0 7.5	31.0	+ 0.2	31.2	3.12
22	— 29. 9. 0 *a.* — 29. 8. 7 *p.*	11.7	7.5 9.0	17.0	+ 0.5	17.5	1.75
23	— 29. 8. 7 *p.* — 30. 10. 75 *a.*	14.0	9.0 10.3	14.0	+ 0.4	14.4	1.44
24	— 30. 10. 75 *a.* Juli 1. 9. 5 *a.*	22.75	10.3 13.8	27.0	+ 1.4	28.4	2.84
25	*July* 1. 9. 5 *a.* — 2. 10. 5 *a.*	25.0	13.8 11.0	19.0	— 1.2	17.8	1.78
26	— 2. 11. 0 *a.* — 2. 9. 1 *p.*	10.1	10.0 10.5	12.5	+ 0.2	12.7	1.27
27	— 2. 9. 2 *p.* — 3. 10. 1 *a.*	12.9	10.5 16.0	8.0	+ 2.4	10.4	1.04
28	— 3. 10. 1 *a.* — 3. 8. 5 *p.*	10.4	16.0 13.7	21.0	— 1.1	19.9	1.99
29	— 3. 8. 5 *p.* — 4. 9. 25 *a.*	12.75	13.7 8.0	6.0	— 2.1	3.9	0.39
30	— 4. 9. 25 *a.* — 4. 8. 65 *p.*	11.4	8.0 8.0	5.3	0.0	5.3	0.53
31	— 4. 8. 7 *p.* — 5. 9. 0 *a.*	12.3	8.0 9.0	4.0	+ 0.3	4.3	0.43
32	— 5. 9. 0 *a.* — 5. 10. 0 *p.*	13.0	9.0 7.2	13.0	— 0.5	12.5	1.25
33	— 5. 10. 0 *p.* — 6. 10. 5 *a.*	12.5	7.2 8.0	0.0	+ 0.2	0.2	0.02
34	— 6. 10. 5 *a.* — 6. 10. 5 *p.*	12.0	8.0 8.0	5.0	0.0	5.0	0.50
35	— 6. 10. 5 *p.* — 7. 9. 0 *a.*	10.5	8.0 8.8	6.0	+ 0.3	6.3	0.63
36	Juli 7. $9.^{h}5$ *p.* *July* 8. 10. 7 *a.*	13.2	8.0 12.0	17.5	+ 1.4	18.9	1.89
37	— 8. 10. 7 *a.* — 9. 9. 5 *a.*	22.8	12.0 8.0	40.5	— 1.4	39.1	3.91
38	— 9. 11. 5 *a.* — 9. 7. 5 *p.*	8.0	7.8 7.5	9.8	— 0.1	9.7	0.97
39	— 24. 10. 0 *a.* — 25. 9. 5 *a.*	23.5	11.6 9.1	27.0	— 0.9	26.1	2.61
40	— 25. 9. 5 *a.* — 25. 8. 0 *p.*	10.5	9.1 9.2	9.0	0.0	9.0	0.90
41	— 25. 8. 0 *p.* — 26. 9. 7 *a.*	13.7	9.2 8.9	0.0	— 0.1	0.0	0.00
42	— 26. 9. 7 *a.* — 26. 8. 8 *p.*	11.1	8.9 9.5	5.0	+ 0.2	5.2	0.52
43	— 26. 8. 8 *p.* — 27. 10. 5 *a.*	13.7	9.5 9.1	1.5	— 0.1	1.4	0.14
44	— 27. 10. 5 *a.* — 28. 9. 8 *a.*	23.3	9.1 4.5	4.0	— 1.2	2.8	0.28
45	— 28. 9. 8 *a.* — 30. 10. 0 *a.*	48.2	4.5 4.2	7.0	0.0	7.0	0.70
46	— 30. 10. 5 *a.* — 30. 10. 0 *a.*	23.5	3.9 3.4	3.0	— 0.1	2.9	0.29
47	— 31. 10. 0 *a.* August 1. 9. 0 *a.*	23.0	3.4 2.8	13.0	— 0.1	12.9	1.29
48	— 1. 9. 0 *a.* — 2. 10. 0 *a.*	25.0	2.8 6.2	18.0	+ 0.6	18.6	1.86
49	— 2. 10. 0 *a.* — 3. 9. 5 *a.*	23.5	6.2 4.0	27.0	— 0.4	26.6	2.66
50	— 3. 9. 5 *a.* — 4. 10. 1 *a.*	24.6	4.0 3.2	3.5	— 0.1	3.4	0.34
51	— 4. 10. 1 *a.* — 5. 11. 0 *a.*	24.9	3.2 4.2	4.5	+ 0.2	4.7	0.47
52	— 5. 11. 0 *a.* — 6. 10. 5 *a.*	23.5	4.2 5.2	3.0	+ 0.2	3.2	0.32
53	— 6. 10. 5 *a.* — 7. 9. 75 *a.*	23.25	5.2 8.0	12.0	+ 0.7	12.7	1.27
54	— 8. md. (*noon*) — 9. 9. 5 *a.*	21.5	10.0 14.6	47.0	+ 1.9	48.9	4.89
55	— 9. 9. 5 *a.* — 10. 9. 75 *a.*	24.25	14.6 16.6	51.0	+ 1.0	52.0	5.20
56	— 10. 9. 75 *a.* — 10. 8. 2 *p.*	10.4	16.6 16.9	30.0	+ 0.2	30.2	3.02
57	— 10. 8. 2 *p.* — 11. 9. 0 *a.*	12.8	16.9 18.0	12.5	+ 0.6	13.1	1.31
58	— 11. 9. 0 *a.* — 12. 10. 5 *a.*	25.5	18.0 16.2	49.7	— 1.0	48.7	4.87
59	— 12. 10. 5 *a.* — 13. 8. 25 *a.*	21.75	16.2 14.5	42.5	— 0.8	41.7	4.17
60	— 13. 9. 25 *a.* — 14 9. 5 *a.*	25.25	14.5 14.2	34.0	— 0.2	33.8	3.38
61	— 14. 9. 5 *a.* — 15. 9. 5 *a.*	24.0	14.2 13.2	13.0	— 0.4	12.6	1.26
62	— 15. 9. 5 *a.* — 16. 9. 5 *a.*	24.0	13.2 7.2	28.4	— 2.1	26.3	2.63
63	— 16. 9. 5 *a.* — 17. 11. 5 *a.*	26.0	7.2 7.2	23.0	0.0	23.0	2.30
64	— 17. 11. 5 *a.* — 18. 9. 3 *a.*	21.8	7.2 9.9	22.5	+ 0.8	23.3	2.33
65	— 18. 9. 3 *a.* — 19. 10. 5 *a.*	25.2	9.9 10.0	25.5	0.0	25.5	2.55
66	— 19. 10. 5 *a.* — 20. md. (*noon*)	25.5	10.0 11.3	21.0	+ 0.5	21.5	2.15
67	— 20. md. (*noon*) — 21. 9. 4 *a.*	21.4	11.3 11.9	28.5	+ 0.2	28.7	2.87
68	— 21. 9. 4 *a.* — 22. 10. 0 *a.*	24.6	11.9 13.0	53.0	+ 0.5	53.5	5.35
69	— 22. 10. 0 *a.* — 23. 8. 5 *a.*	22.5	13.0 10.8	5.0	— 0.9	4.1	0.41

I 1877 fordunstede $128.^{mm}39$ Vand i 1191.7 Timer, eller gjennemsnitlig $0.^{mm}108$ pr. Time, $2.^{mm}59$ pr. 24 Timer. Paa Dagtimerne falde 61 Procent, paa Nattetimerne 39 Procent. Søndenfor Polarcirkelen (60° til 66°.5 Bredde) er i den varme Havstrøm fordunstet gjennemsnitlig $0.^{mm}127$ pr. Time, $3.^{mm}05$ pr. 24 Timer. Nordenfor Polarcirkelen (66°.5 til 71°) er i samme fordunstet gjennemsnitlig $0.^{mm}122$ pr. Time, $2.^{mm}94$ pr. 24 Timer. I Polarstrømmen ved Jan Mayen er fordunstet $0.^{mm}037$ pr. Time, $0.^{mm}88$ pr. 24 Timer.

I 1878 fordunstede $47.^{mm}26$ Vand i 713.2 Timer, eller gjennemsnitlig $0.^{mm}067$ pr. Time, $1.^{mm}60$ pr. 24 Timer. Paa Dagtimerne falde 65 Procent, paa Nattetimerne 35 Procent. Søndenfor den 75de Breddegrad (70°—75°) er i den varme Havstrøm, (inclusive Østhavet) fordunstet $0.^{mm}090$ pr. Time, $2.^{mm}16$ pr. 24 Timer. Mellem den 75de og 80de Breddegrad fordunstede i den samme Strøm (Vest af Spidsbergen) $0.^{mm}052$ pr. Time, $1.^{mm}24$ pr. 24 Timer. I den varme Strøm i det hele taget fordunstede $0.^{mm}070$ pr. Time, $1.^{mm}68$ pr. 24 Timer. I Polarstrømmen, Vest af Spidsbergen, fordunstede $0.^{mm}046$ pr. Time, $1.^{mm}11$ pr. 24 Timer.

Man ser i disse Tal Klimatets, navnlig Temperaturens Indflydelse paa Fordunstningen. Den følgende lille Tabel giver en Oversigt herover.

hours. In 1876, the observations refer to the tract of ocean between Norway and Iceland, ranging from the 61st to the 66th parallel of latitude.

In 1877, the quantity of water evaporated was $128.^{mm}39$ in 1191.7 hours, or, on an average, $0.^{mm}108$ per hour = $2.^{mm}59$ in 24 hours. During the day-hours the evaporation was 61 per cent, during the night-hours 39 per cent. South of the Polar Circle (60° to 66°.5 N. lat.) the average evaporation in the warm ocean current was $0.^{mm}127$ per hour = $3.^{mm}05$ in 24 hours. North of the Polar Circle (66°.5 to 71° N. lat.), the average evaporation in the said current was $0.^{mm}122$ per hour = $2.^{mm}94$ in 24 hours. In the Polar current, off the Island of Jan Mayen, the evaporation was $0.^{mm}037$ per hour = $0.^{mm}88$ in 24 hours.

In 1878, the quantity of water evaporated was $47.^{mm}26$ in 713.2 hours, or, on an average, $0.^{mm}067$ per hour = $1.^{mm}60$ in 24 hours. During the day-hours the evaporation was 65 per cent, during the night-hours 35 per cent. South of the 75th parallel of latitude (70°—75°), the evaporation in the warm ocean current (inclusive of the Barents' Sea) was $0.^{mm}090$ per hour = $2.^{mm}16$ in 24 hours. Between the 75th and the 80th parallels of latitude, the evaporation in the same current (west of Spitzbergen) was $0.^{mm}052$ per hour = $1.^{mm}24$ in 24 hours. In the warm current the average evaporation was $0.^{mm}070$ per hour = $1.^{mm}68$ in 24 hours. In the Polar current, west of Spitzbergen, the evaporation was $0.^{mm}046$ per hour = $1.^{mm}11$ in 24 hours.

These figures show the effect of climate, more particularly of temperature, on evaporation. In the following short Table this influence is synoptically collated.

	Bredde (*Latitude*)		Fordunstningshøjde. (*Height of Water Evaporated*) Dag (*Day*)	Nat (*Night*)	pr. Døgn (*per 24 Hours*)
1876.	61°—66°	Varm Strøm (*Warm Current*)	56 %	44 %	3.77^{mm}
1877.	60—67	Varm Strøm (*Warm Current*)	61	39	3.05
—	67—71				2.94
—	69—71	Polar Strøm (*Polar Current*)			0.88
1878.	70—75	Varm Strøm (*Warm Current*)	65	35	2.16
—	75—80				1.24
—	72—78	Polar Strøm (*Polar Current*)			1.11

Fordunstningsmaaleren *B*, med noget forhøjet Kant paa Fordunstningsskaalen, medfulgte den norske Korvet „Nordstjernen", Chef Commandør H. J. Müller, paa dens Togt til Vestindien Vinteren 1878. Beregningen af de i Januar 1879 daglig anstillede Fordunstningsmaalinger, i Vestindien, dels ved St. Thomas, dels ved Martinique giver en Fordunstningshøjde af $7.^{mm}73$ pr. 24 Timer, og deraf $4.^{mm}90$ eller 63 Procent om Dagen (8 *a.*—8 *p.*) og $2.^{mm}83$

The atmometer *B* — but with a margin somewhat more elevated for the evaporating dish — was sent out with the Norwegian corvette "Nordstjernen," Commodore H. J. Müller commander, on her cruise to the West Indies in the winter of 1878—1879. The computation of the daily measurements of evaporation made in January 1879 in the West Indies, partly at St. Thomas, partly at Martinique, give for the water evaporated a depth of $7.^{mm}73$ in 24 hours, —

Slingrebøjler. Det kan meget vel oftere have hændt, at Vand er slynget ud af Fordunstningskarret, uden at saadant er blevet bemerket.

Maaske vil man faa den bedste Bestemmelse af Havvandets Fordunstning ved Iagttagelser gjorte paa Landstationer ude paa Kysterne. Her kunne Apparaterne, der vistnok bør være svømmende, staa i Ro. Vindhastigheden, der spiller en saadan overvejende Rolle, kunde registreres ved en Vindmaaler, der stod lige ved Apparatet, i samme Højde som dette. Og de øvrige Beregningselementer kunde ogsaa registreres i Nærheden.

Indsendt i September 1881.

paratus did not swing well in the gimbals. It is by no means improbable that water was frequently jerked out of the evaporating dish without our having noticed it.

Possibly the best measurements of the evaporation of sea-water may be effected by observations taken at land-stations on the coast. There, the apparatus, which should unquestionably be kept floating, can remain at rest. The velocity of the wind, that plays so important a part in determining the results, could be registered with an anemometer, mounted in immediate proximity to the apparatus, and at the same height. The other elements of computation might also be registered close by.

Received September 1881.

Translated into English by **John Hazeland.**

THE NORWEGIAN NORTH-ATLANTIC EXPEDITION

1876—1878.

X.

METEOROLOGY.

BY

H. MOHN.

WITH 13 WOODCUTS, 3 PLATES AND ONE MAP.

CHRISTIANIA.

PRINTED BY GRØNDAHL & SØN.

1883.

LEIPZIG,
F. F. KÖHLER.

LONDON,
SAMPSON, LOW, MARSTON, SEARLE & RIVINGTON.

PARIS,
K. NILSON.

Stanford University Libraries
3 6105 010 959 158